1. January 1993
2. November 1993
3. December 1993
4. January 1994
5. February 1994
6. March 1994

The above-described violations reflect only what information currently available to PEEC indicates. PEEC intends to sue for all permit violations, including those yet to be uncovered and those committed subsequent to the date of this notice of intent to sue.

PEEC alleges that Ak-Wa continues to violate its NPDES permit.

Pursuant to Section 309(d) of the CWA, 33 USC § 1319(d), each of the above-described violations subjects the violator to a penalty of up to $25,000. In addition to civil penalties, PEEC will seek injunctive relief to prevent further violations pursuant to Sections 505(a) and (d) of the CWA, 33 USC § 1365(a) and (d), and such other relief as is permitted by law. Also, Section 505(d) of the CWA, 33 USC § 1365(d), permits prevailing parties to recover costs including attorney's fees.

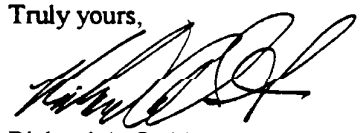
The party giving this notice and intending to file suit is

Pacific Environmental Enforcement Council, a project of
Atlantic States Legal Foundation, Inc.
658 W. Onondaga St.
Syracuse NY 13204-3757
(315)475-1170.

PEEC believes that this NOTICE OF INTENT TO SUE sufficiently states grounds for filing suit. We intend, at the close of the 60-day notice period, or shortly thereafter, to file a citizen suit against Ak-Wa under Section 505(a) of the Clean Water Act for violations.

During the 60-day notice period, we would be willing to discuss effective remedies for the violations noted in this letter and settlement terms. If you wish to pursue such discussions in the absence of litigation, we suggest that you initiate those discussions within 10 days of receiving this notice so that a meeting can be arranged and so that negotiations may be completed before the end of the 60-day notice period. David Kamas will be in Seattle and available for a meeting on Monday, May 23. We do not intend to delay the filing of a complaint in federal court if discussions are continuing when the notice period ends.

Truly yours,



Richard A. Smith
Attorney

cc:
Carol Browner, Administrator (By Certified Mail)
EPA
401 M St. SW
Washington DC 20460

Charles Clarke, Administrator (By Certified Mail)
EPA Region X
1200 6th Ave., Mail Stop SO-101
Seattle WA 98101

Mary Riveland, Director (By Certified Mail)
Washington Department of Ecology
Box 47600
Olympia WA 98504-7600

D. Frederick Olson, Registered Agent (By Certified Mail)
Ak-Wa, Inc.
401 Alexander Ave., Bldg. # 9588
Tacoma WA 98421

AK - WA Inc.

401 Alexander Bldg. 9588 • Tacoma, WA 98421 • (206) 272-0108 • Fax (206) 272-4952
Mailing Address: P.O. Box 872, Tacoma, WA 98401-0872

MAY 12, 1994
SERIAL #05-209

DEPT. OF ECOLOGY
SOUTHWEST REGION
P.O. BOX 47775
OLYMPIA, WA
98504-7775

ATTN: GARIN SHRIEVE

SUBJ: DMR SUBMITTAL FEB-MAR-APRIL 1994

DEAR GARIN,

PLEASE FIND ENCLOSED COPIES OF AK-WA'S DMRS FOR FEB-MAR-APRIL 1994, STORM WATER AND UNDOCKINGS.

IF YOU SHOULD HAVE ANY QUESTIONS PLEASE CONTACT ME AT (206) 272-0108. THANK YOU.

SINCERELY,

ROCKY BECKER
ECOLOGY MANAGER

RB/wab

FILE=08S\894\DOC\AKWA\96-289.245

SPECTRA Laboratories, Inc.

CHAIN of CUSTODY

2221 Ross Way * Tacoma, WA 98421 * (206) 272-4850 * Fax (206) 572-9838

PAGE 1 of 1

CLIENT : AK-WA INC.
PROJECT: NPDES STORMWATER
CONTACT: ROCKY
PHONE : 272-0107
PURCHASE ORDER #: 7008-017 2/17/94

SAMPLE ID	DATE	TIME	S/W/O	NUMBER OF CONTAINERS
OUTFALL 002	2-16-94	AM	W	2
003				2
004				2

HYDROCARBONS							ORGANICS						TCLP D-LIST					METALS			OTHER							RETURN
WTPH-HCID	BTEX/WTPH-G	BTEX	WTPH-G	WTPH-D	TPH 418.1/MOD	F.O.G. 413.1/413.2	8240/8260 VOA	8240 CHLOR SOLVENTS	8270 SEMI-VOA	PAH/PNA	8270 ORG CHLOR PEST	8080 PCB	TCLP METALS (8)	TCLP-ZHE 8240 VOA	TCLP 8270 SEMI-VOA	TCLP 8270 PEST	TCLP 8270 HERB	TOTAL 6010/AES0029	TOTAL GFAA	TOTAL LEAD	pH 9040/9045	TOX 9020/9076	TOC 9060/PSEP	FLASH POINT	TOTAL S.SOLIDS	DIL-N-GREASE	TR COPPER	TR ZINC	TR LEAD	DISPOSE (Fee applies)
																									✓	✓	✓	✓	✓	LAB ID
																									✓	✓	✓	✓	✓	
																									✓	✓	✓	✓	✓	

SPECIAL INSTRUCTIONS / COMMENTS:

(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY
PRINTED NAME ROCKLAND BECKER	PRINTED NAME	PRINTED NAME
COMPANY AK-WA INC	COMPANY	COMPANY
DATE 2-17-94 TIME 3:15 (PM)	DATE TIME	DATE TIME
(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY
PRINTED NAME Debbie	PRINTED NAME	PRINTED NAME
COMPANY Spectra	COMPANY	COMPANY

STORMWATER OUTFALL

16 Feb 1994 SAMPLE COLLECTION AND DATA SHEET

Outfall 002 GPM 24 PH 8.02

Comments: Temp - 10.4° C

Outfall 003 GPM 16 PH 7.95

Comments: Temp - 9.8°C

Outfall 004 GPM 6 PH 7.68

Comments: Temp - 10.5° C

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

March 2, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S402-174
Applies to Spectra #'s
2677 through 2679

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank
Units: mg/L

Date Analyzed: 2-15-94

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.3	9.6	85	9.6	85	0

METHOD BLANK

Date Extracted: 2-28-94 & 3-1-94

Date Analyzed: 2-28-94 & 3-1-94

Oil and Grease, mg/L

<0.1

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

March 2, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Date Analyzed: 2-24-94
Spectra Project: S402-174
Applies to Spectra #'s
2677 through 2679

Total Recoverable Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	32

Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

March 2, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 004
Project: NPDES Stormwater
P.O. #70080172142P
Sample Matrix: Water
Date Sampled: 2-16-94
Date Received: 2-17-94
Spectra Project: S402-174
Spectra #2679

Oil and Grease, mg/L		0.5
Total Suspended Solids, mg/L		7.3
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	36
Zinc	(Zn)	1,243

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

March 2, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 003
Project: NPDES Stormwater
P.O. #70080172142P
Sample Matrix: Water
Date Sampled: 2-16-94
Date Received: 2-17-94
Spectra Project: S402-174
Spectra #2678

Oil and Grease, mg/L		3.8
Total Suspended Solids, mg/L		34
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	118
Zinc	(Zn)	635

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

March 2, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 002
Project: NPDES Stormwater
P.O. #70080172142P
Sample Matrix: Water
Date Sampled: 2-16-94
Date Received: 2-17-94
Spectra Project: S402-174
Spectra #2677

Oil and Grease, mg/L		1.6
Total Suspended Solids, mg/L		3.0
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	58
Zinc	(Zn)	546

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

CHAIN of CUSTODY

2221 Ross Way * Tacoma, WA 98421 * (206) 272-4850 * Fax (206) 572-9838

CLIENT : AK-WA INC.
PROJECT: NPDES STORMDRAINS
CONTACT: ROCKY
PHONE: 272-0108
PURCHASE ORDER #: 7008-017- 16AP

SAMPLE ID	DATE	TIME	S/W/O	NUMBER OF CONTAINERS
OUTFALL 002	4-8-94	AM	W	
003				
004				

HYDROCARBONS							ORGANICS						TCLP D-LIST					METALS			OTHER									
WTPH-HCID	BTEX/WTPH-G	BTEX	WTPH-G	WTPH-D	TPH 418.1/MOD	F.O.G. 413.1/413.2	8240/8260 VOA	8240 CHLOR SOLVENTS	8270 SEMI-VOA	PAH/PNA	8270 ORG CHLOR PEST.	8080 PCB	TCLP METALS (8)	TCLP-ZHE 8240 VOA	TCLP 8270 SEMI-VOA	TCLP 8270 PEST	TCLP 8270 HERB	TOTAL 6010/AES0029	TOTAL CFAA	TOTAL LEAD	pH 9040/9045	TOX 9020/9076	TOC 9060/PSEP	FLASH POINT	TOTAL S.SOLIDS	OIL N GREASE	TSS	TR COPPER	TR ZINC	NOILMAL
																									↘	↘	↘	↘	↘
																									↘	↘	↘	↘	↘
																									↘	↘	↘	↘	↘

RETURN

DISPOSE
Fee applies

LAB ID

SPECIAL INSTRUCTIONS / COMMENTS:

(SIGNATURE) RELINQUISHED BY:	(SIGNATURE) RELINQUISHED BY:	(SIGNATURE) RELINQUISHED BY:
PRINTED NAME: ROCKLAND BECKER	PRINTED NAME:	PRINTED NAME
COMPANY: AK-WA INC.	COMPANY	COMPANY
DATE: 4-12-94 TIME: 2:30	DATE: TIME:	DATE TIME
(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY
PRINTED NAME	PRINTED NAME	PRINTED NAME
COMPANY	COMPANY	COMPANY

8 April 94

STORMWATER OUTFALL

SAMPLE COLLECTION AND DATA SHEET

Outfall 002 GPM 5 PH 7.5

Comments: Temp. 11.7°C

Outfall 003 GPM 10 PH 7.34

Comments: Temp. 11.8°C

Outfall 004 GPM 10 PH 7.05

Comments: Temp. 11.8°C

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S404-080
Applies to Spectra #'s
5250 through 5252

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank
Units: mg/L

Date Analyzed: 4-14-94

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.6	10.6	91	10.6	92	1

METHOD BLANK

Date Extracted: 4-19-94

Date Analyzed: 4-19-94

Oil and Grease, mg/L

<0.1

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Date Analyzed: 4-19-94
Spectra Project: S404-080
Applies to Spectra #'s
5250 through 5252

Total Recoverable Metals, ug/L

Copper	(Cu)	6
Zinc	(Zn)	21

Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 004
Project: NPDES Storm
P.O. #7008-017169P
Sample Matrix: Water
Date Sampled: 4-8-94
Date Received: 4-12-94
Spectra Project: S404-080
Spectra #5252

Oil and Grease, mg/L		0.7
Total Suspended Solids, mg/L		2.6
Total Recoverable Metals, ug/L		
Copper	(Cu)	65
Zinc	(Zn)	1887

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.

Total Suspended Solids performed by Standard Method 2540-D

Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 003
Project: NPDES Storm
P.O. #7008-017169P
Sample Matrix: Water
Date Sampled: 4-8-94
Date Received: 4-12-94
Spectra Project: S404-080
Spectra #5251

Oil and Grease, mg/L		1.9
Total Suspended Solids, mg/L		6.0
Total Recoverable Metals, ug/L		
Copper	(Cu)	94
Zinc	(Zn)	445

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Outfall 002
Project: NPDES Storm
P.O. #7008-017169P
Sample Matrix: Water
Date Sampled: 4-8-94
Date Received: 4-12-94
Spectra Project: S404-080
Spectra #5250

Oil and Grease, mg/L		3.1
Total Suspended Solids, mg/L		3.2
Total Recoverable Metals, ug/L		
Copper	(Cu)	102
Zinc	(Zn)	689

Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.

Total Suspended Solids performed by Standard Method 2540-D

Total Recoverable Metals performed by EPA Method 200.2

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

NAME AK-WA, INC.

ADDRESS 401 ALEXANDER AVE BLDG, 588
TACOMA, WA. 98421

FACILITY

LOCATION

WA-004014-2 (PERMIT NUMBER)

(DISCHARGE NUMBER)

STORMWATER MONTHLY

OUTFALL 004 FEB / MAR / APRIL '94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	02	01	TO	94	04	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (12-37)		(3 Card Only) (46-53) QUANTITY OR LOADING AVERAGE	MAXIMUM	UNITS	(4 Card Only) (51-54) QUALITY OR CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-69)	SAMPLE TYPE (69-70)
P H (units)	SAMPLE MEASUREMENT				7.05	7.365	7.68			2/92	COMP
	PERMIT REQUIREMENT										COMP
GREASE & OIL (mg/1)	SAMPLE MEASUREMENT				0.5	0.6	0.7				COMP
	PERMIT REQUIREMENT										COMP
TOTAL SUSPENDED SOLIDS (mg/1)	SAMPLE MEASUREMENT				2.6	4.95	7.3				COMP
	PERMIT REQUIREMENT										COMP
TR COPPER (ug/1)	SAMPLE MEASUREMENT				36	50.5	65				COMP
	PERMIT REQUIREMENT										COMP
TR ZINC (ug/1)	SAMPLE MEASUREMENT				1243	1565	1887				COMP
	PERMIT REQUIREMENT										COMP
TR LEAD (ug/1)	SAMPLE MEASUREMENT				<40	<40	<40				COMP
	PERMIT REQUIREMENT										COMP
	SAMPLE MEASUREMENT										COMP
	PERMIT REQUIREMENT										COMP

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

OSCAR FRED OLSON

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN, AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 3 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 206 NUMBER 272-0108

DATE: YEAR 94 MO 05 DA 12

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

EPA Form 3320-1 (Rev. 9-88) *Previous editions may be used.* (REPLACES EPA FORM T 40 WHICH MAY NOT BE USED)

NAME AK-WA, INC.
ADDRESS 401 ALEXANDER AVE BLDG. 588
TACOMA, WA. 98421
FACILITY
LOCATION

WA-004014-2 (PERMIT NUMBER)

(DISCHARGE NUMBER)

STORM WATER MONTHLY
OUTFALL 003 FEB / MAR / APRIL '94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	02	01	TO	94	04	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (12-37)		(3 Card Only) (46-53) QUANTITY OR LOADING (54-61) AVERAGE	MAXIMUM	UNITS	(4 Card Only) (18-45) QUALITY OR CONCENTRATION (46-53) MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
P H (units)	SAMPLE MEASUREMENT				7.34	7.695	7.95			2/92	COMP
	PERMIT REQUIREMENT										COMP
GREASE & OIL (mg/1)	SAMPLE MEASUREMENT				1.9	2.85	3.8				COMP
	PERMIT REQUIREMENT										COMP
TOTAL SUSPENDED SOLIDS (mg/1)	SAMPLE MEASUREMENT				6.0	20	34				COMP
	PERMIT REQUIREMENT										COMP
TR COPPER (ug/1)	SAMPLE MEASUREMENT				94	106	118				COMP
	PERMIT REQUIREMENT										COMP
TR ZINC (ug/1)	SAMPLE MEASUREMENT				445	540	635				COMP
	PERMIT REQUIREMENT										COMP
TR LEAD (ug/1)	SAMPLE MEASUREMENT				<40	<40	<40				COMP
	PERMIT REQUIREMENT										COMP
	SAMPLE MEASUREMENT										COMP
	PERMIT REQUIREMENT										COMP

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
OSCAR FRED OLSON
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN, AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION I BELIEVE THE SUBMITTED INFORMATION IS TRUE ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319 *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 206 NUMBER 272-0108

DATE: YEAR 94 MO 05 D: 12

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

NAME AK-WA, INC.
ADDRESS 401 ALEXANDER AVE BLDG, 588
TACOMA, WA. 98421
FACILITY
LOCATION

WA-004014-2 (PERMIT NUMBER)
DISCHARGE NUMBER

STORMWATER MONTHLY
OUTFALL 002 FEB / MAR / APRIL '94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	02	01	TO	94	04	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

NOTE: Read instructions before completing this form.

PARAMETER (12-37)		(3 Card Only) (46-53) QUANTITY OR LOADING (54-61) AVERAGE	MAXIMUM	UNITS	(4 Card Only) (45-45) QUALITY OR CONCENTRATION (46-53) (54-61) MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMPLE TYPE (69-70)
P H (units)	SAMPLE MEASUREMENT				7.5	7.85	8.2			2/92	COMP
	PERMIT REQUIREMENT										COMP
GREASE & OIL (mg/1)	SAMPLE MEASUREMENT				1.6	2.35	3.1				COMP
	PERMIT REQUIREMENT										COMP
TOTAL SUSPENDED SOLIDS (mg/1)	SAMPLE MEASUREMENT				3.0	3.1	3.2				COMP
	PERMIT REQUIREMENT										COMP
TR COPPER (ug/1)	SAMPLE MEASUREMENT				58	80	102				COMP
	PERMIT REQUIREMENT										COMP
TR ZINC (ug/1)	SAMPLE MEASUREMENT				546	617.5	689				COMP
	PERMIT REQUIREMENT										COMP
TR LEAD (ug/1)	SAMPLE MEASUREMENT				<40	<40	<40				COMP
	PERMIT REQUIREMENT										COMP
	SAMPLE MEASUREMENT										COMP
	PERMIT REQUIREMENT										COMP

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER
OSCAR FRED OLSON
TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN, AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 3 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 206, NUMBER 272-0108

DATE: YEAR 94, MO 05, D 12

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

EPA Form 3320-1 (Rev. 9-88) *Previous editions may be used.* (REPLACES EPA FORM 7-40 WHICH MAY NOT BE USED)

SPECTRA Laboratories, Inc.
2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

February 15, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S402-052
Applies to Spectra #'s
1960 and 1961

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank
Units: mg/L

Date Analyzed: 2-15-94

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.3	9.6	85	9.6	85	0

METHOD BLANK

Date Extracted: 2-15-94

Date Analyzed: 2-15-94

Oil and Grease, mg/L

<0.1

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

February 15, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Date Analyzed: 2-9-94
Spectra Project: S402-052
Applies to Spectra #'s
1960 and 1961

Total Recoverable Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	30

Total Dissolved Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	27

Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

February 15, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Background
Project: NPDES Undocking
P.O. #7008-003164P
Sample Matrix: Water
Date Sampled: 2-4-94
Date Received: 2-7-94
Spectra Project: S402-052
Spectra #1961

pH		7.08
Oil and Grease, mg/L		<0.1
Total Suspended Solids, mg/L		8.6
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	6
Zinc	(Zn)	<6
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	5
Zinc	(Zn)	<6

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.
2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

February 15, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Walla Walla
Project: NPDES Undocking
P.O. #7008-003164P
Sample Matrix: Water
Date Sampled: 2-4-94
Date Received: 2-7-94
Spectra Project: S402-052
Spectra #1960

pH		7.12
Oil and Grease, mg/L		<0.1
Total Suspended Solids, mg/L		38.8
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	235
Zinc	(Zn)	105
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	51
Zinc	(Zn)	30

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

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Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

CHAIN of CUSTODY

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850 • Fax (206) 572-9838

PAGE 1 of 1

CLIENT : AK-WA INC
PROJECT: NPDES LINDBERGH
CONTACT: ROCKY
PHONE: 272-0108
PURCHASE ORDER #: 7108-003-171

SAMPLE ID	DATE	TIME	S/W/O	NUMBER OF CONTAINERS
AURORA	3-01-94	0700	W	
BACKGROUND	3-01-94	0630	W	

HYDROCARBONS							ORGANICS						TCLP D-LIST					METALS	OTHER								RETURN / DISPOSE / LAB ID
WTPH-HCID	BTEX/WTPH-G	BTEX	WTPH-G	WTPH-D	TPH 418.1/MOD	F.O.G. 413.1/413.2	8240/8260 VOA	8240 CHLOR SOLVENTS	8270 SEMI-VOA	PAH/PNA	8270 ORG CHLOR PEST.	8080 PCB	TCLP METALS (8)	TCLP-ZHE 8240 VOA	TCLP 8270 SEMI-VOA	TCLP 8270 PEST	TCLP 8270 HERB	TOTAL 6010/AES0029	TOTAL CFAA	TOTAL LEAD	pH 9040/9045	TOX 9020/9076	TOC 9060/PSEP	FLASH POINT	TOTAL S. SOLIDS	OIL N GREASE	TR + DIS COPPER	TR + DIS LEAD	TR + DIS ZINC	NORMAL	
																					↘				↘	↘	↘	↘	↘	↘	
																					↘				↘	↘	↘	↘	↘	↘	

SPECIAL INSTRUCTIONS / COMMENTS:

(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY
PRINTED NAME: ROCKY BECKER	PRINTED NAME:	PRINTED NAME:
COMPANY: AK-WA INC.	COMPANY:	COMPANY:
DATE: 3-12-94 3-02-94 TIME: 2:30	DATE: TIME:	DATE: TIME:
(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY
PRINTED NAME	PRINTED NAME	PRINTED NAME
COMPANY	COMPANY	COMPANY
DATE TIME	DATE TIME	DATE TIME

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S404-079
Applies to Spectra #'s
5248 and 5249

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank
Units: mg/L

Date Analyzed: 4-14-94

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.6	10.6	91	10.6	92	1

METHOD BLANK

Date Extracted: 4-19-94

Date Analyzed: 4-19-94

Oil and Grease, mg/L

<0.1

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SPECTRA Laboratories, Inc.

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April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Date Analyzed: 4-19-94
Spectra Project: S404-079
Applies to Spectra #'s
5248 and 5249

Total Recoverable Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	6
Zinc	(Zn)	21

Total Dissolved Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	<6

Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Background
Project: NPDES Undocking
P.O. #7008-003171P
Sample Matrix: Water
Date Sampled: 3-1-94
Date Received: 4-12-94
Spectra Project: S404-079
Spectra #5249

pH		7.60
Oil and Grease, mg/L		<0.1
Total Suspended Solids, mg/L		9.2
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	24
Zinc	(Zn)	20
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	18
Zinc	(Zn)	16

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

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Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Aurora
Project: NPDES Undocking
P.O. #7008-003171P
Sample Matrix: Water
Date Sampled: 3-1-94
Date Received: 4-12-94
Spectra Project: S404-079
Spectra #5248

pH		7.71
Oil and Grease, mg/L		0.1
Total Suspended Solids, mg/L		6.0
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	64
Zinc	(Zn)	56
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	39
Zinc	(Zn)	25

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

CHAIN of CUSTODY

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850 • Fax (206) 572-9838

CLIENT : AK-WA INC

PROJECT: NPDES UNDOCKING

CONTACT: ROLKY

PHONE : 272-0107

PURCHASE ORDER #: 7008-003-1304

SAMPLE ID	DATE	TIME	S/W/O	NUMBER OF CONTAINERS
ALASKA PACKER	3-30-94	0700	W	4
BACKGROUND	3-30-94	0700	W	2

HYDROCARBONS							ORGANICS						TCLP D-LIST						METALS		OTHER								RETURN / DISPOSE / LAB ID
WTPH-HCID	BTEX/WTPH-G	BTEX	WTPH-G	WTPH-D	TPH 418.1/MOD	F.O.G. 413.1/413.2	8240/8260 VOA	8240 CHLOR SOLVENTS	8270 SEMI-VOA	PAH/PNA	8270 ORG CHLOR PEST.	8080 PCB	TCLP METALS (8)	TCLP-ZHE 8240 VOA	TCLP 8270 SEMI-VOA	TCLP 8270 PEST.	TCLP 8270 HERB	TOTAL 6010/ABS0029	TOTAL GFAA	TOTAL LEAD	PH 9040/9045	TOX 9020/9076	TOC 9060/PSEP	FLASH POINT	TOTAL S. SOLIDS	OIL-N-GREASE	TR C DIS COPPER	TR C DIS LEAD	TR C DIS ZINC	NORMAL	
																					✓				✓	✓	✓	✓	✓	
																					✓				✓	✓	✓	✓	✓	

SPECIAL INSTRUCTIONS / COMMENTS:

(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY
PRINTED NAME: ROLLAND BELKER	PRINTED NAME:	PRINTED NAME:
COMPANY: AK-WA INC.	COMPANY:	COMPANY:
DATE: 4-12-94 TIME: 2:30 (PM)	DATE: TIME:	DATE: TIME:
(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY	(SIGNATURE) RECEIVED BY
PRINTED NAME:	PRINTED NAME	PRINTED NAME
COMPANY	COMPANY	COMPANY

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S404-081
Applies to Spectra #'s
5253 and 5254

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank
Units: mg/L

Date Analyzed: 4-14-94

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.6	10.6	91	10.6	92	1

METHOD BLANK

Date Extracted: 4-19-94

Date Analyzed: 4-19-94

Oil and Grease, mg/L

<0.1

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Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Date Analyzed: 4-19-94
Spectra Project: S404-081
Applies to Spectra #'s
5253 and 5254

Total Recoverable Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	6
Zinc	(Zn)	21

Total Dissolved Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	<6

Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

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Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Background
Project: NPDES Undocking
P.O. #7008-003170P
Sample Matrix: Water
Date Sampled: 3-30-94
Date Received: 4-12-94
Spectra Project: S404-081
Spectra #5254

pH		7.62
Oil and Grease, mg/L		<0.1
Total Suspended Solids, mg/L		4.2
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	26
Zinc	(Zn)	24
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	222
Zinc	(Zn)	13

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

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Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

April 21, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Alaska Packer
Project: NPDES Undocking
P.O. #7008-003170P
Sample Matrix: Water
Date Sampled: 3-30-94
Date Received: 4-12-94
Spectra Project: S404-081
Spectra #5253

pH		7.68
Oil and Grease, mg/L		0.2
Total Suspended Solids, mg/L		8.8
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	360
Zinc	(Zn)	53
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	242
Zinc	(Zn)	43

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

CHAIN of CUSTODY

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850 • Fax (206) 572-9838

CLIENT : AK-WA INC.
PROJECT: NPDES UNDOCKING
CONTACT: ROLKY BECKER
PHONE : 272-0101
PURCHASE ORDER #: 7008-003

SAMPLE ID	DATE	TIME	S/W/O	NUMBER OF CONTAINERS
CASCADE BOATS	4-25-94	AM	W	4
BACKGROUND	4-25-94	AM	W	2

HYDROCARBONS							ORGANICS						TCLP D-LIST					METALS			OTHER							RETURN
WTPH-HCID	BTEX/WTPH-G	BTEX	WTPH-G	WTPH-D	TPH 418.1/MOD	F.O.G. 413.1/413.2	8240/8260 VOA	8240 CHLOR SOLVENTS	8270 SEMI-VOA	PAH/PNA	8270 ORG CHLOR PEST.	8080 PCB	TCLP METALS (8)	TCLP-ZHE 8240 VOA	TCLP 8270 SEMI-VOA	TCLP 8270 PEST.	TCLP 8270 HERB	TOTAL 6010/AES0029	TOTAL GFAA	TOTAL LEAD	pH 9040/9045	TOX 9020/9076	TOC 9060/PSEP	FLASH POINT	TOTAL S. SOLIDS	OIL-N-GREASE	TR-N-DIS COPPER	TR-N-DIS LEAD	TR-N-DIS ZINC	NORMAL	DISPOSE Fee applies
																														LAB ID
																					✓			✓	✓	✓	✓	✓		
																					✓			✓	✓	✓	✓	✓		

SPECIAL INSTRUCTIONS / COMMENTS:

(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY	(SIGNATURE) RELINQUISHED BY
PRINTED NAME: ROCKLAND BECKER	PRINTED NAME:	PRINTED NAME:
COMPANY: AK-WA INC	COMPANY:	COMPANY:
DATE: 4-28-94 TIME: 1130 AM PM	DATE: TIME:	DATE: TIME:
(SIGNATURE) RECEIVED BY:	(SIGNATURE) RECEIVED BY:	(SIGNATURE) RECEIVED BY
PRINTED NAME: Debbie	PRINTED NAME:	PRINTED NAME:
COMPANY: Spectra	COMPANY	COMPANY

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

May 9, 1994

AK-WA
401 Alexander, Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

EPA Method 413.2
Sample Matrix: Water
Spectra Project: S404-224
Applies to Spectra #'s
5923 and 5924

OIL AND GREASE
QUALITY CONTROL RESULTS

MS/MSD

Spiked Sample: Method Blank Date Analyzed: 5-3-94
Units: mg/L

Compound	Sample Result	Spike Amount	Spike Result	% Recovery	Dup. Result	Dup. % Recovery	RPD
Oil and Grease	<0.1	11.6	10.1	87	10.3	89	3

METHOD BLANK

Date Extracted: 5-4-94 Date Analyzed: 5-4-94

Oil and Grease, mg/L <0.1

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.
2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

May 9, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

METHOD BLANK
Sample Matrix: Water
Spectra Project: S404-224
Applies to Spectra #'s
5923 and 5924

Total Recoverable Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	<6

Total Dissolved Metals, ug/L

Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	<6

Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.

2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

May 9, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Background
Project: NPDES Undocking
P.O. #7008-003-176-P
Sample Matrix: Water
Date Sampled: 4-25-94
Date Received: 4-28-94
Spectra Project: S404-224
Spectra #5924

pH		7.66
Oil and Grease, mg/L		5.7
Total Suspended Solids, mg/L		0.1
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	12
Zinc	(Zn)	13
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	<2
Zinc	(Zn)	<6

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

SPECTRA Laboratories, Inc.
2221 Ross Way • Tacoma, WA 98421 • (206) 272-4850

May 9, 1994

AK-WA
401 Alexander Bldg. 580
Tacoma, WA 98421

Attn: Rocky Becker

Sample ID: Cascade Boats
Project: NPDES Undocking
P.O. #7008-003-176-P
Sample Matrix: Water
Date Sampled: 4-25-94
Date Received: 4-28-94
Spectra Project: S404-224
Spectra #5923

pH		7.75
Oil and Grease, mg/L		0.4
Total Suspended Solids, mg/L		16
Total Recoverable Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	106
Zinc	(Zn)	30
Total Dissolved Metals, ug/L		
Lead	(Pb)	<40
Copper	(Cu)	28
Zinc	(Zn)	22

pH testing performed by EPA Method 9040
Fats, Oil and Grease testing by EPA Method 413.2 Partition Infrared.
Total Suspended Solids performed by Standard Method 2540-D
Total Recoverable Metals performed by EPA Method 200.2
Metals testing performed by EPA Method 200.7

SPECTRA LABORATORIES, INC.

Steven G. Hibbs, Chemist

NAME AK-WA, INC.

ADDRESS 401 ALEXANDER AVE BLDG 588
TACOMA, WA. 98421

FACILITY

LOCATION

(2-16) WA-004014-2 PERMIT NUMBER

(17-19) DISCHARGE NUMBER

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	02	01	TO	94	04	30
	(20-21)	(22-23)	(24-25)		(26-27)	(28-29)	(30-31)

UNDOCKINGS
FEB / MAR / APRIL '94

NOTE: Read Instructions before completing this form.

PARAMETER (32-37)		(3 Card Only) (46-53) QUANTITY OR LOADING (54-61) AVERAGE	MAXIMUM	UNITS	(4 Card Only) (18-45) QUALITY OR CONCENTRATION (46-53) MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX (62-63)	FREQUENCY OF ANALYSIS (64-68)	SAMP TYPI (69-7
DISSOLVED COPPER (ug/1)	SAMPLE MEASUREMENT	61.25	222		28	90	242			4/89	COMP
	PERMIT REQUIREMENT										COMP
DISSOLVED LEAD (ug/1)	SAMPLE MEASUREMENT	<40	<40		<40	<40	<40				COMP
	PERMIT REQUIREMENT										COMP
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										
	SAMPLE MEASUREMENT										
	PERMIT REQUIREMENT										

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER		TELEPHONE		DATE		
OSCAR FRED OLSON	I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT. SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. (Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)	[signature]	206	272-0108	94	05	1
TYPED OR PRINTED		SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT	AREA CODE	NUMBER	YEAR	MO	D

COMMENT AND EXPLANATION OF ANY VIOLATIONS (Reference all attachments here)

NAME AK-WA, INC.
ADDRESS 401 ALEXANDER AVE BLDG, 588
TACOMA, WA. 98421
FACILITY
LOCATION

DISCHARGE MONITORING REPORT (DMR)

WA-004014-2 (PERMIT NUMBER)

(DISCHARGE NUMBER)

UNDOCKINGS
FEB / MAR / APRIL '94

MONITORING PERIOD

	YEAR	MO	DAY		YEAR	MO	DAY
FROM	94	02	01	TO	94	04	30

NOTE: Read instructions before completing this form.

PARAMETER		(3 Card Only) QUANTITY OR LOADING AVERAGE	MAXIMUM	UNITS	(4 Card Only) QUALITY OR CONCENTRATION MINIMUM	AVERAGE	MAXIMUM	UNITS	NO. EX	FREQUENCY OF ANALYSIS	SAMP TYPE
P H (units)	SAMPLE MEASUREMENT	7.49	7.66		7.12	7.58	7.75			4/89	COMP
	PERMIT REQUIREMENT										COMP
GREASE & OIL (mg/1)	SAMPLE MEASUREMENT	1.425	5.7		D.1	.175	D.4				COMP
	PERMIT REQUIREMENT										COMP
TOTAL SUSPENDED SOLIDS (mg/1)	SAMPLE MEASUREMENT	5.525	9.2		6.0	17.4	38.8				COMP
	PERMIT REQUIREMENT										COMP
TR COPPER (ug/1)	SAMPLE MEASUREMENT	17	26		64	191.25	360				COMP
	PERMIT REQUIREMENT										COMP
TR ZINC (ug/1)	SAMPLE MEASUREMENT	14.25	24		30	61	105				COMP
	PERMIT REQUIREMENT										COMP
TR LEAD (ug/1)	SAMPLE MEASUREMENT	<40	<40		< 40	<40	<40				COMP
	PERMIT REQUIREMENT										COMP
DISSOLVED ZINC (ug/1)	SAMPLE MEASUREMENT	7.25	16		22	30	43				COMP
	PERMIT REQUIREMENT										COMP

NAME/TITLE PRINCIPAL EXECUTIVE OFFICER

OSCAR FRED OLSON

TYPED OR PRINTED

I CERTIFY UNDER PENALTY OF LAW THAT I HAVE PERSONALLY EXAMINED AND AM FAMILIAR WITH THE INFORMATION SUBMITTED HEREIN; AND BASED ON MY INQUIRY OF THOSE INDIVIDUALS IMMEDIATELY RESPONSIBLE FOR OBTAINING THE INFORMATION, I BELIEVE THE SUBMITTED INFORMATION IS TRUE, ACCURATE AND COMPLETE. I AM AWARE THAT THERE ARE SIGNIFICANT PENALTIES FOR SUBMITTING FALSE INFORMATION, INCLUDING THE POSSIBILITY OF FINE AND IMPRISONMENT SEE 18 U.S.C. § 1001 AND 33 U.S.C. § 1319. *(Penalties under these statutes may include fines up to $10,000 and/or maximum imprisonment of between 6 months and 5 years.)*

SIGNATURE OF PRINCIPAL EXECUTIVE OFFICER OR AUTHORIZED AGENT

TELEPHONE: AREA CODE 206, NUMBER 272-0108

DATE: YEAR 94, MO 05, DA 12

COMMENT AND EXPLANATION OF ANY VIOLATIONS *(Reference all attachments here)*

WASHINGTON STATE DEPARTMENT OF ECOLOGY

INSPECTION REPORT

FACILITY NAME:	AK-WA Inc.
ADDRESS:	401 Alexander, Bldg 588, Tacoma, Washington
DATE OF INSPECTION:	May 26, 1994
ECOLOGY REPRESENTATIVE:	Garin Schrieve Mohsen Kourehdar
PURPOSE OF INSPECTION:	To inspect the site and meet with Rocky Becker, compliance officer
TIME ENTERED:	2:30 P.M., May 26, 1994
TIME LEFT:	4:10 P.M., May 26, 1994
WEATHER:	Sunny

Ecology issued NPDES permit No. WA-004014-2 on June 28, 1991 to the referenced facility. The purpose of this site visit was to inspect the operation and to discuss the status of deliverables due to Ecology.

Since this was my first inspection since being assigned to this permit, we toured the facility in order to educate ourselves on the general operations of the company. We were shown the measures taken to implement BMPs required in the permit and the BMP plan. These included storage of blasting grit, measures taken to sweep/clean yard areas, bermed and covered storage of chemicals/paint, curtains and misting of the drydock blasting area, and collection of spent blasting grit from the drydock.

We examined the equipment and operation of the hydroblast recycle system and discussed the operational techniques that the company has employed to manage the system.

Following the yard tour we met with Rocky to discuss the deliverables due and the timeline for implementation of the required stormwater treatment system. Rocky informed us that the Stormwater Engineering Report would be ready in a week, and that we would receive a copy at that time. He indicated that the company's lease with the Port of Tacoma requires the Port to install capital improvements to the drainage/stormwater collection systems. AK-WA has contacted the Port and will provide them with a copy of the Stormwater Engineering Report so that the Port's engineering group can put together plans for the site. Rocky was not sure how long it would take the Port to engineer the improvements and what additional negotiations might be required to complete that aspect of the project. Rocky was under the impression that implementation of the appropriate stormwater treatment measures need only be completed prior to the remediation of the Hylebos Waterway. I informed him that the permit required implementation of the preferred alternative as soon as possible.

AK-WA Shipyards, Inc.

Tacoma, Washington

ENSR

Engineering Report for Industrial Stormwater Treatment System WAC 173-240-130

ENSR Consulting and Engineering

July 1994

Document Number 0072-001-500

AK-WA Shipyards, Inc.

Tacoma, Washington

Engineering Report for Industrial Stormwater Treatment System WAC 173-240-130

ENSR Consulting and Engineering

July 1994

Document Number 0072-001-500

CONTENTS

LIST OF TABLES

LIST OF FIGURES

1.0 INTRODUCTION

AK-WA Incorporated (AK-WA) has been repairing and rebuilding vessels at its present location in Tacoma, Washington, at the mouth of the Hylebos Waterway since 1986. Zindell Marine and Tacoma Boat previously conducted similar operations on this site. This site has been used by the shipbuilding and repair industry for over 70 years. The current property owner is the Port of Tacoma.

The site covers approximately 2.3 acres of land and another 1.7 acres of dry dock and piers. On-site, a wooden drydock can handle vessels up to 10,000 tons. Dockside facilities allow repair of vessels up to 1,000 feet in length. Other facilities are the major plate and fabrication areas; marine construction, warehouse, paint storage, and offices within Building 9588; outfitting docks; grit blasting and paint spray areas; and lumber storage areas. Fabrication, paint, electric, machine, carpentry, and pipe fabrication shops provide services at the shipyard. Small vessels can be repaired on the shoreside area of the facility.

Typical services ("products") include ship repainting and rebuilding, and construction of ship additions. In a typical month, four steel-hulled vessels are repaired or converted at the shipyard. Activities include welding, cutting, machining, sandblasting, painting, carpentry, pipefitting, and electrical wiring.

AK-WA discharges stormwater from the site to the Hylebos Waterway and inner Commencement Bay in accordance with NPDES Permit No. WA 004014-2. To comply with the permit, AK-WA conducted stormwater sampling and analysis at Outfalls 002, 003, and 004 throughout 1992. Samples were analyzed for oil and grease, total suspended solids (TSS), pH, total recoverable (TR) copper, TR lead, TR zinc, TR nickel, and TR mercury. On May 4, 1993, AK-WA received a letter from the Washington Department of Ecology (Ecology) stating that monitoring for TR lead, TR nickel, and TR mercury could be eliminated because these compounds were not detected in toxic amounts for the last 6 monthly rain events. The letter also stated that oil and grease, TSS, TR copper, and TR zinc have exceeded the effluent limitations described in Section S1.A of AK-WA's NPDES permit.

The following table lists the concentrations of these constituents found in the stormwater from late 1991 to early 1993 and the effluent limits provided in the permit.

Constituent	Range of Concentrations Detected in AK-WA Stormwater[1] (mg/l)	Monthly Average Effluent Limitations[2] (mg/l)
Total Suspended Solids (TSS)	1.2 to 688	45
TR Copper	0.16 to 2.8	0.0029 (0.025 before dilution)
TR Zinc	0.38 to 12.3	0.095
Oil and Grease	2.0 to 60.1	10

1 - Six sample events between September 1991 and January 1992.
2 - In accordance with NPDES Permit No. WA 004014-2 Section S1.A.

Due to these exceedances, Ecology required AK-WA to prepare an engineering report in accordance with Section S10.H of its NPDES permit. Section S10.H specifies that the engineering report shall conform to WAC 173-240-110 through 173-240-180 and outline options for meeting stormwater effluent permit limitations for oil and grease, TSS, TR copper, and TR zinc. The minimum design criteria for designing treatment and collection facilities shall be based on the stormwater flow from a 6-month, 24-hour storm event.

AK-WA, in consultation with Ecology, has determined that it will be necessary to treat the stormwater in order to meet the effluent limits. This engineering report describes the conceptual design of the treatment system and satisfies the requirement of NPDES Permit Section S10.H. The engineering report requirements described in WAC 173-240-130 are cross-referenced with the corresponding sections of this report in Table 1-1.

Section 2.0 of this report describes stormwater drainage at the site and provides details on how the drainage system will be modified as part of the effort to meet the effluent limitations. Section 3.0 describes the treatment alternatives and a conceptual design for the treatment system. The design information in Section 3.0 is based upon a treatability study, which is described in Appendix A. Local, state, and federal permits required for the project are listed in Section 4.0, and a schedule for implementation of stormwater treatment is presented in Section 5.0.

TABLE 1-1

WAC 173-240-130
Cross-Reference Index

WAC 173-240-130 Sections	Location Within Engineering Report
2a. Type of industry	Section 1.0
2b. The kind and quantity of finished product	Section 1.0
2c. The quantity and quality of water used by the industry and a description of how consumed or disposed of	Section 3.3
2d. The amount and kind of chemicals used in the treatment process, if any	Appendix A
2e. The basic design data and sizing calculations	Sections 2.3 and 3.3
2f. A discussion of the suitability of the proposed site for the facility	Section 3.4
2g. A description of the treatment process and operation, including a flow diagram	Section 3.3, Figure 3-1
2h. All necessary maps and layout sketches	Figure 3-1
2i. Provisions for a bypass, if any	Section 3.3
2j. Physical provision for oil and hazardous material spill control and/or accidental discharge prevention	Section 3.3
2k. Results to be expected from the treatment process including the predicted wastewater characteristics, as shown in the waste discharge permit, where applicable	Section 3.2
2l. A description of the receiving water, location of the point of discharge, applied water quality standards, and how water quality standards will be met outside of any applicable dilution zone	Sections 2.0 and 3.0
2m. Detailed outfall analysis	Not included
2n. The relationship to existing treatment facilities, if any	Section 3.3
2o. Discussion if discharge is to a municipal sewerage system	Not applicable
2p. Discussion if discharge is through land application	Not applicable
2q. A statement, expressing sound engineering justification through the use of pilot plant data, results from other similar installations, and/or scientific evidence from the literature, that the effluent from the proposed facility will meet applicable permit effluent limitations and/or pretreatment standards	Section 3.2, Appendix A
2r. A discussion of the method of final sludge disposal selected and any alternatives considered with reasons for rejection	Section 3.3
2s. A statement as to who will own, operate, and maintain the system after construction	Section 3.3
2t. A statement regarding compliance with any state or local water quality management plan or any such plan adopted pursuant to the Federal Water Pollution Control Act as amended	Section 3.2
2u. Provisions for any committed future plans	Section 3.3
2v. A discussion of the various alternatives evaluated, if any, and reasons they are unacceptable	Section 3.2
2w. A timetable for final design and construction	Section 5.0
2x. A statement regarding compliance with the State Environmental Policy Act (SEPA)	Section 4.0
2y. Additional items to be included if the system includes solid waste leachate treatment	Not applicable

2.0 DRAINAGE

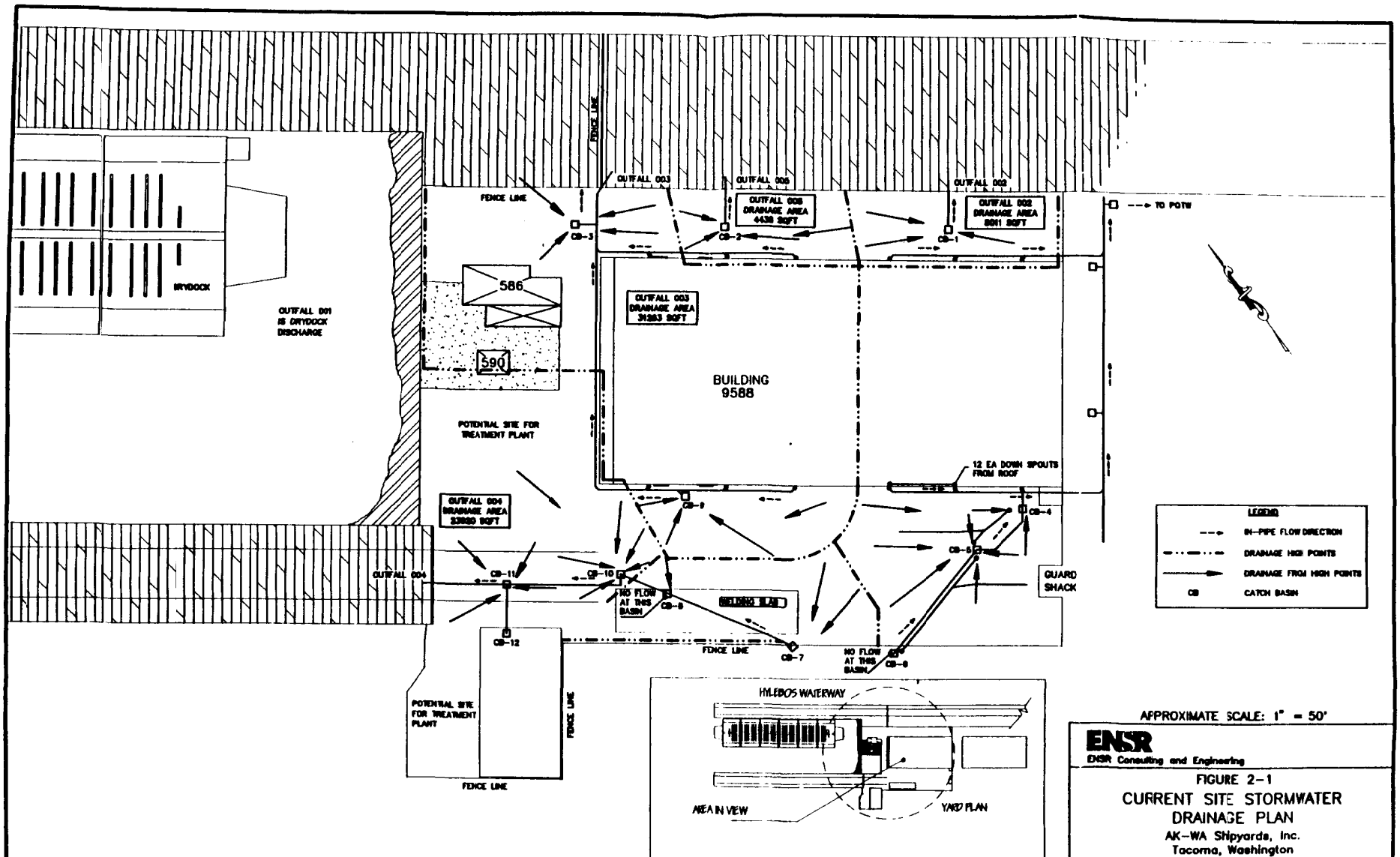
2.1 Current Drainage System

The current drainage system is shown in Figure 2-1 and includes runoff from the site, runoff from the buildings on-site, and run-on from adjacent properties. On-site there are 12 catch basins. Two of these catch basins, CB-6 and CB-8, are old and not functioning properly as the concrete bottoms of the catch basins no longer exist. There are five outfalls on-site including Outfall 001 which discharges stormwater only from the drydock.

2.2 Modified Drainage System

As part of the effort to meet effluent limitations, the stormwater collection and drainage system will be modified. The conceptual design for the modified drainage system can be seen in Figure 2-2. In this design, run-on from other sites adjacent to the AK-WA site will be restricted by a small concrete berm along the fence line. The site runoff, with the exception of runoff from Building 9588 and the dry dock, will be routed to the southwestern edge of the AK-WA property where a stormwater treatment plant will be installed in one of two available locations. All stormwater runoff will be collected in catch basins and then directed, via sump pumps, to a holding/equalization tank at the new treatment plant. After treatment, the stormwater will be discharged through a diffuser to Commencement Bay.

The runoff from Building 9588 will be collected and discharged without treatment through a separate outfall. Sandy Stephens of the Washington Department of Ecology (Ecology) agreed on September 28, 1993, in a meeting with Rocky Becker and Dan Nichols of AK-WA and Bill Conbere of ENSR that the roof drainage of Building 9588 does not need to be treated and can be discharged through an existing outfall. Building 9588 is four stories high and the roof runoff should not be contaminated with the heavy metals or oil and grease that are present in the shipyard. The roof currently has 12 downspouts, 6 on each side of the building. ENSR recommends that AK-WA install new non-metallic gutters along the roof that have sufficient capacity and grade to convey water to a single downspout located near the outfall. The runoff from the dry dock will continue to be discharged from Outfall 001 without treatment.



SOURCE: AK-WA Shipyards, Inc., FSCH No. 46388, Drawing No. YARD PLAN, 07/28/83.

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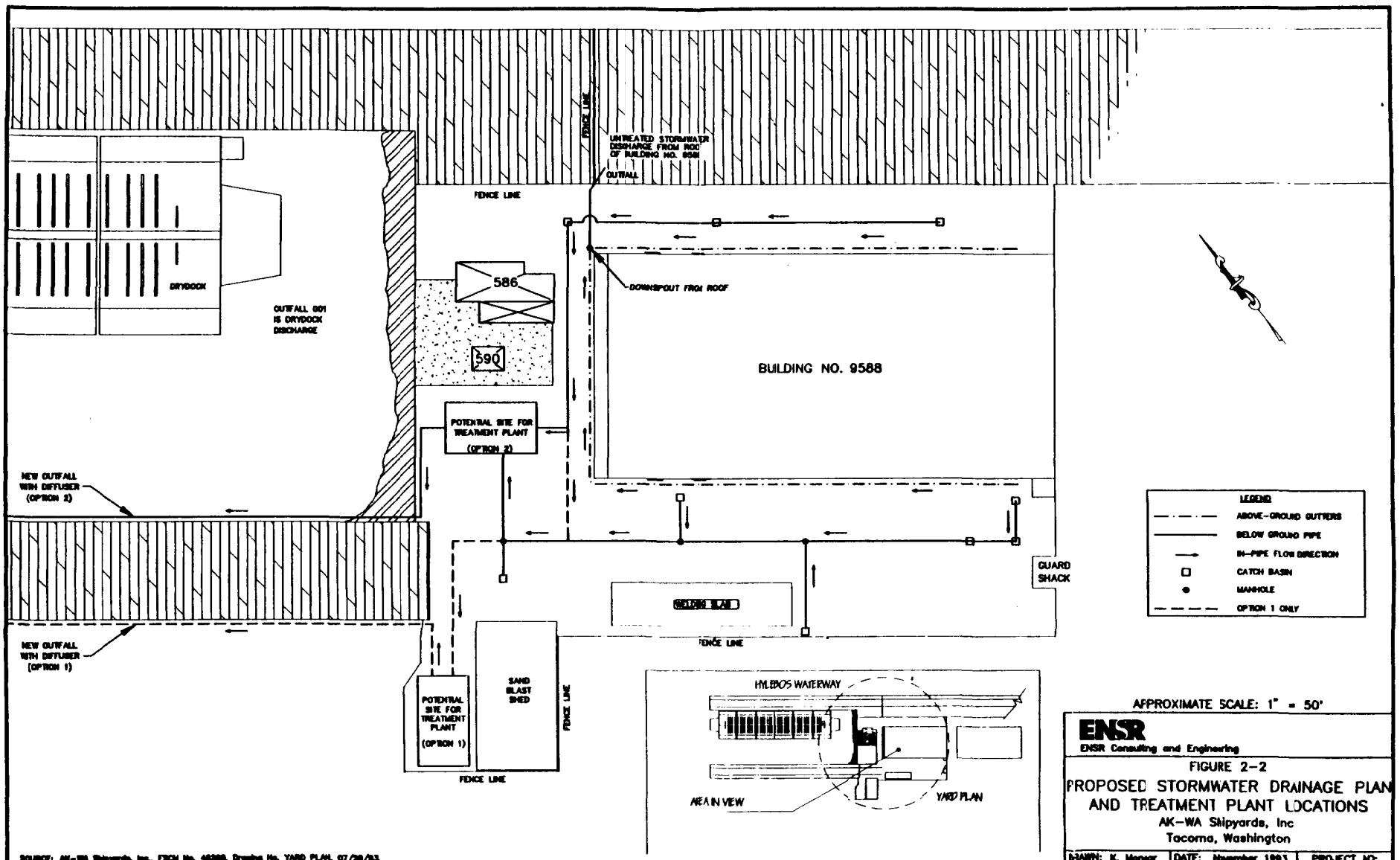
FIGURE 2-1
CURRENT SITE STORMWATER DRAINAGE PLAN
AK-WA Shipyards, Inc.
Tacoma, Washington

DRAWN: K. Menger	DATE: November 1993	PROJECT NO
FILE NO: AW001101	CHECKED: E. Allen	0072-001-500



APPROXIMATE SCALE: 1" = 50'

SOURCE: AK-WA Shipyards, Inc., FSCM No. 46288, Drawing No. YARD PLAN, 07/28/93.

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FIGURE 2-2
PROPOSED STORMWATER DRAINAGE PLAN AND TREATMENT PLANT LOCATIONS
AK-WA Shipyards, Inc
Tacoma, Washington

DRAWN: K. Monjar	DATE: November 1993	PROJECT NO: 0072-001-500
D.E. NO: AW001502	CHECKED: B. Cantera	

2.3 Design Stormwater Volume

The design stormwater volume, based on a 6-month, 24-hour storm, is 55,000 gallons. The 6-month, 24-hour storm generates 1.28 inches (0.107 feet) of rainfall.[1] The dryland surface area of the AK-WA facility is approximately 102,100 square feet, and the surface area of Building 9588 is approximately 33,400 square feet. The design volume is calculated as follows:

$$0.107 \text{ ft} \times (102{,}100 \text{ ft}^2 - 33{,}400 \text{ ft}^2) = 7{,}350 \text{ ft}^3$$

$$7{,}350 \text{ ft}^2 \times 7.48 \text{ gallons/ft}^3 = 55{,}000 \text{ gallons}$$

The treatment system will be sized to treat the 6-month, 24-hour storm event stormwater within 72 hours. In the case where the rainfall exceeds the 6-month, 24-hour storm event the additional water will overflow the stormwater lift station sump, bypassing the treatment system. It is assumed that additional stormwater that would bypass the treatment system in the time period immediately following a storm event would meet water quality standards.

[1] Washington Department of Ecology. February 1992. Storm Water Management Manual for the Puget Sound Basin, isopluvial map from NOAA Atlas 2, Vol. IX, Washington.

3.0 STORMWATER TREATMENT

Stormwater from the AK-WA site will be treated to remove copper, zinc, and oil and grease before discharge. A treatability study was performed in order to determine the best method of treatment for AK-WA stormwater (Appendix A). The results of this study were used to prepare design alternatives. The study and the recommended treatment alternative are discussed below.

3.1 Treatability Study

The treatability study was performed by ENSR Development, a sister company of ENSR, in Houston, Texas. Stormwater samples from a simulated storm at AK-WA were sent to ENSR Development for analysis. The storm was simulated by flushing a paved surface in a heavily used portion of the facility with municipal water from a hose; the water was collected at an existing catch basin. Three treatment techniques were tested to determine their effectiveness at removing copper and zinc from the stormwater. The methods tested were:

- **Polymeric flocculation/precipitation:** Using a dry powder, flocculation and precipitation of inorganic metallic pollutants was used to overcome the electro-kinetic equilibrium factors holding the pollutants in solution.

- **Hydroxide precipitation:** Using lime as an inexpensive source of the hydroxide ion, precipitation tests at pH of 8.5, 9.0, and 9.5 were conducted to determine the extent of copper and zinc removal.

- **Sulfide precipitation/flocculation:** Using sodium sulfide (Na_2S) and sodium hydrosulfide (NaHS), the quantity of sulfide required to precipitate copper and zinc was determined using three different ratios of sulfide to zinc (the higher concentration contaminant) to determine the optimum dosage.

3.2 Recommended Treatment

Of the three types of treatment tested, sodium sulfide precipitation with pH adjustment using lime provided the best results for copper and zinc removal. Sodium sulfide precipitation, with and without a flocculating agent, provided adequate results under test conditions. At pH 11 and without using flocculating agents, copper was removed to 0.016 mg/l and zinc to 0.18 mg/l after passing through a 2.5-micron filter. With flocculation also at pH 11, copper and zinc were removed to less than 0.020 mg/l using a 0.5- to 1.5-micron filter.

There are advantages and disadvantages to using flocculating agents. Without flocculating agents, there is a greater load on the filters due to the solids that were not settled out of the supernatant water. Using flocculating agents, the load on the filters is reduced but the cost of the chemicals is increased.

With discharge through a diffuser and resulting dilution, sulfide precipitation without flocculation should treat the stormwater to acceptable levels in accordance with NPDES Permit No. WA 004014-2 and WAC 173-201-047 Water Quality Standards for Surface Waters of the State of Washington. ENSR recommends that a cost-benefit analysis of treatment with and without flocculation be performed.

3.3 Treatment System Design

The treatment system design is a continuous process in which stormwater is pumped from the holding/equalization tank to the reactor tank. In the reactor tank, reagents are added and the metal precipitated out. This is a two-stage process: the metals are first coagulated by the reagents and then settled out as sludge. TSS will be eliminated in this two-stage process along with metals. Oil and grease will be controlled by an oil/water separator that will process all the stormwater before it enters the treatment system. Oil and grease enter the stormwater system primarily in the runoff of the area where vehicles are refueled and hydraulic fluids are changed. These substances may be present in small quantities on the pavement and enter the storm drain system during the first flush of a storm event.

Sludge will be collected and discharged from the reactor tank at the bottom and the supernatant water will be discharged from the top. Based on the stormwater sample tested, the quantity of sludge generated is estimated to be 10 to 40 tons per year on a dry basis and 30 to 120 tons per year on a wet basis. The final method of sludge disposal ultimately depends on the composition of the sludge produced. Because of the high metals content, the sludge cannot be disposed of on land or in the ocean. The sludge will most likely be landfilled as a non-hazardous material. The cost to landfill the wet sludge may vary from $50 to $200 per ton depending on its composition and characteristics.

The supernatant will undergo a polishing filtration step to remove any remaining particulate, then the pH will be readjusted with sulfuric acid prior to being discharged through a diffuser at the end of the dock. The diffuser will be positioned below the water level at low tide so that the effluent will meet water quality standards outside of any applicable dilution zone.

A treatment system bypass would be included and would be used only if the proposed system is overloaded. A 6-month, 24-hour storm would produce approximately 55,000 gallons of

stormwater to be treated. A treatment system design flow of 15 gpm will allow treatment of the 6-month, 24-hour storm event stormwater in less than 72 hours.

A flow diagram showing the general unit operations of the treatment system is shown in Figure 3-1. A hydraulic profile of the system can be prepared when a definitive design is chosen for the system.

The major components of the treatment system will include:

- Oil/water separator
- Sump and lift station
- Holding/equalization tank with 80,000-gallon capacity
- Reactor tank
- Clarifier
- Treated stormwater suspended solids filter
- Sludge dewatering unit (e.g., belt press, filter press)
- Chemical storage and delivery units
- Instrumentation, pumps and mixers

For oil and hazardous material spill control and/or accidental discharge prevention, ENSR recommends that sorbent booms and other sorbent material be readily available in case of a spill. ENSR also recommends that a concrete containment berm with a sump pump be constructed around the new treatment facility. Any leaks or spills from the treatment plant can then be recovered and routed back through the treatment system.

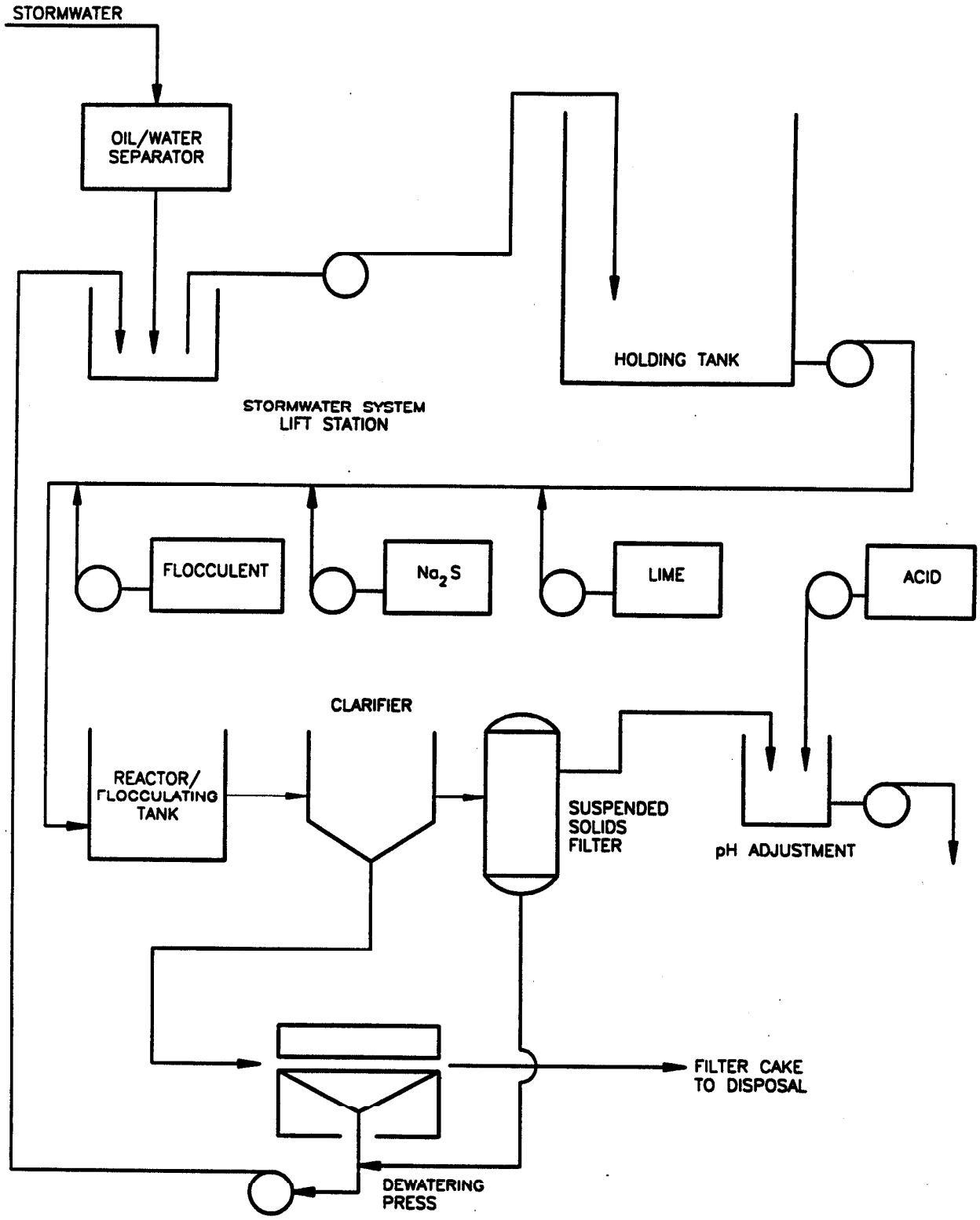
This treatment system has no relationship to the existing process water treatment facility. There is no discharge to a municipal sewerage system or through land application. There is no solid waste leachate treatment system. The only special provisions for treating this stormwater are disposal procedures for the sludge generated during treatment.

The treatment system will be owned and operated by AK-WA Inc. with an operations and maintenance manual provided by the treatment system manufacturer. The stormwater collection system will be owned by the Port of Tacoma and operated by AK-WA. There are no provisions for any committed future plans.

The quantity and quality of water used by the industry is not relevant since the water of concern is stormwater.

FIGURE 3-1

CHEMICAL PRECIPITATION FLOW CONFIGURATION



3.4 Diffuser Design

A definitive diffuser design has not been determined.

3.5 Site Location

The sites available for the treatment plant are limited. Two possible locations are in the vicinity of current Outfall 004. South of Outfall 004 approximately 2,500 ft^2 are available, and north of Outfall 004 approximately 6,000 ft^2 are available. These two locations are shown on Figure 2-2.

The advantages of these sites are that they are the only large areas available and they are located close to the dock. The end of the dock appears to be a good location for an outfall diffuser.

A disadvantage of these sites for location of the treatment plant is the soil composition. In this area the soil appears to be part of the Puyallup Series.[2] The top 12 inches is a fine sandy loam with a weak subangular block structure. This type of soil is prone to sinkholes and does not provide the rigidity necessary to support heavy structures. A concrete slab will most likely have to be poured to serve as a foundation for the treatment system, especially underneath the holding tank. Prior to construction, the soils will need to be inspected for stability by an engineer and foundation supports should be designed as necessary.

There are no residential properties near the proposed treatment plant. The AK-WA site is surrounded by industrial facilities ranging from chlorine production to scrap metal processing.

[2]U.S. Department of Agriculture Soil Conservation Service. 1977. Soil Survey of Pierce County Area, Washington.

4.0 PERMITS REQUIRED

The permits required before the proposed system can be constructed are as follows:

- Local (apply for together at City of Tacoma)
  - Shoreline Permit
  - State Environmental Policy Act (SEPA) Checklist
- State and federal (apply for at the same time after local permits obtained)
  - Hydraulic Project Application (HPA) - Washington Department of Fisheries
  - Nationwide Permit - U.S. Army Corps of Engineers
- Other
  - Building Permit with Structural Analysis - City of Tacoma
  - Courtesy Notification - Puyallup Tribe

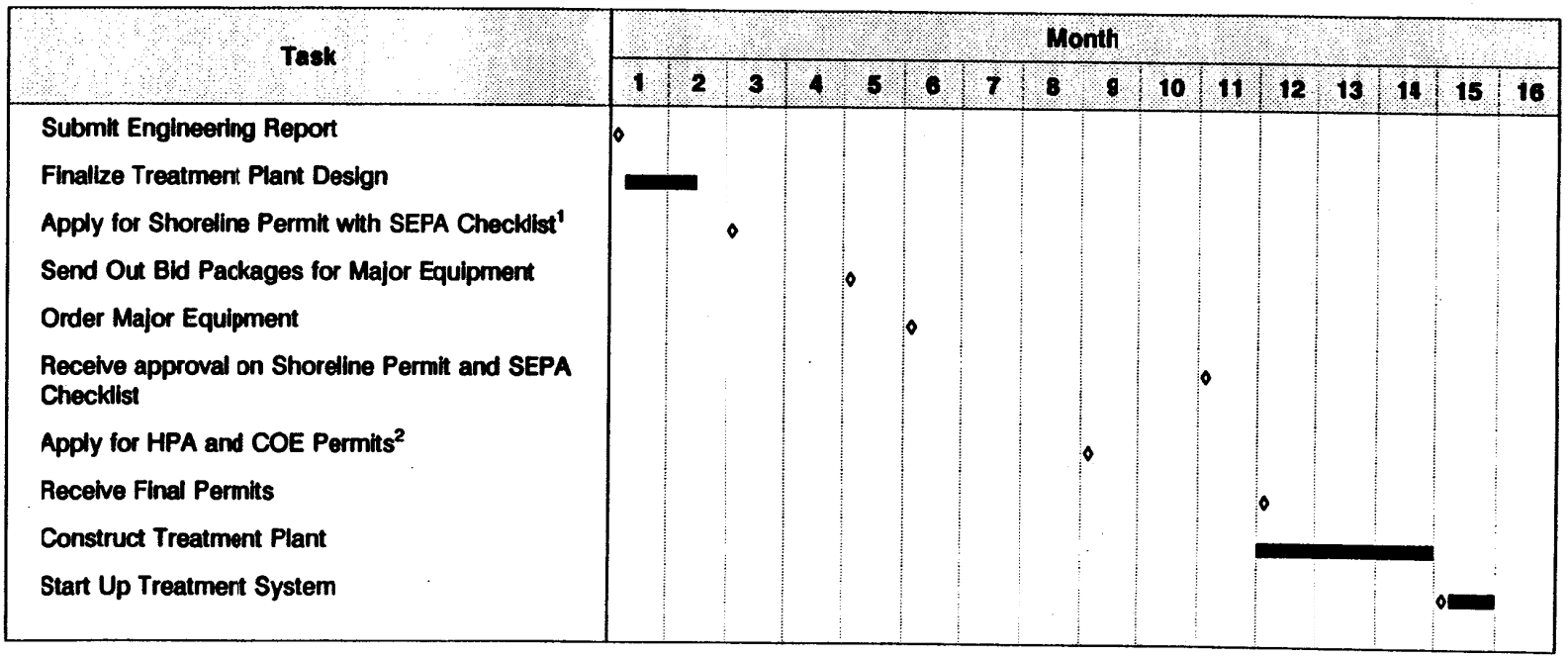
The permitting process will take approximately 9 months. The shoreline permit and the SEPA checklist have to be done first, and they must be sent in together to the City of Tacoma. After approval by the City of Tacoma, AK-WA can apply for the Department of Fisheries and the Corps of Engineers permits. Before approval of the Shoreline Permit and the SEPA Checklist are complete, the Puyallup Tribe should be contacted as a courtesy as they will review all permits.

5.0 SCHEDULE

The attached timeline, Figure 5-1, shows the estimated schedule for the project. The estimated time required to design, permit, and construct the treatment plant following submittal of the Engineering Report is 15 months.

FIGURE 5-1

Schedule for Stormwater Treatment Plant Construction
AK-WA, Inc.
Tacoma, Washington



[1] SEPA = State Environmental Policy Act

[2] HPA = Hydraulic Project Application (Dept. of Fisheries); COE = Corps of Engineers

Appendix A

Results From Treatability Study to Remove Metals From AK-WA Stormwater

Performed By:

ENSR Development
Houston, Texas

APPENDIX A

RESULTS OF TREATABILITY STUDY TO REMOVE METALS FROM AK-WA STORMWATER

1.0 Background

AK-WA Inc. has been operating a ship repairing and rebuilding facility in Tacoma at the mouth of Hylebos Waterway since 1986. The entire dry land portion of the AK-WA facility is paved; therefore, precipitation that collects as surface water on-site is collected in the storm drains. The discharge stream becomes contaminated primarily with copper and zinc due to contact with waste material that collects on the paved surfaces.

Data collected at AK-WA indicate that the stormwater contains on the average 400 μg/l copper and 1,000 μg/l zinc. Data also indicate that the concentrations of contaminants such as lead, benzene, toluene, are usually below the Marine Water Quality criteria.

A simulated storm event was produced at the AK-WA site and stormwater samples were collected on September 9, 1993. A treatability study was conducted to evaluate the feasibility of removing copper and zinc using precipitation and flocculation technology. This document contains a summary of the results of ENSR's treatability studies.

2.0 Objective

The main objectives of the treatability study were as follows:

1. To evaluate the effectiveness of hydroxide precipitation of copper and zinc
2. To evaluate the effectiveness of sulfide precipitation of copper and zinc
3. To evaluate the effectiveness of flocculation/removal of copper and zinc
4. To prepare a schematic diagram of the recommended treatment option
5. To estimate the operational and capital costs for the recommended treatment scheme

3.0 Scope of Work and Approach

The treatability study proposed by ENSR was conducted at ENSR Development's Houston Process Laboratory. Three techniques were evaluated to determine the efficiency of removing copper and zinc from AK-WA stormwater discharge streams. These techniques were primarily based on the formation of insoluble metal hydroxides, metal sulfides, or metal flocculates at optimum pH. A brief description of the scope of work and approach is given here.

3.1 Hydroxide Precipitation

Normally, metal hydroxides have minimum solubility in water in the range of pH 7.5 to 11. Unfortunately, all metals do not reach minimum solubility at the same pH, so that the optimum pH of the system has to be a compromise. Figure 1 shows solubility of various metal hydroxides in water as a function of pH. It should be noted that these solubilities are purely theoretical. In the presence of other contaminants the system will probably behave differently. Therefore, optimum performance is generally determined through laboratory treatability testing. According to the data in Figure 1, copper (Cu) can be precipitated out of water at a pH of 8.7 to less than 1 μg/l (0.001 mg/l). Zinc, however, can be reduced to less than 100 μg/l at a pH of 9.2. Lime and sodium hydroxide were used in this study as a source of hydroxide ions.

3.2 Sulfide Precipitation

Except for precipitation as hydroxides, sulfide precipitation of metals has probably been the most widely used method to remove metals from stormwater. Most metal sulfides are less soluble in water than hydroxides at alkaline pH. In some instances sulfide solubilities are orders of magnitude lower than their hydroxide counterparts. Figure 2 shows solubilities of metal hydroxides and sulfides in water. Precipitation is normally conducted with sodium sulfide (Na_2S) and sodium hydrosulfide (NaHS). The sulfide is added in the form of a solution. Treatability studies were conducted to determine the effect of pH and sulfide dosage on copper and zinc precipitation.

3.3 Polymeric Flocculation of Metals

CETCO (Colloid Environmental Technologies Company) markets a series of products (CETCO RM-10) composed of minerals, inorganic and organic acids and bases, and polymers blended into complex and carefully controlled formulations. The acidic portion of the formulation goes into solution first and causes a pH drop and a breakdown of oily emulsions. The oil species are then attracted by the cationic polymers. The bases in the RM-10 product go into solution next, raising the pH enough to trigger the removal of metals from solution as hydroxide precipitates. These hydroxides then combine with the polymers and clay to form a thick, easily separated mass. The sludge produced from this process is non-hazardous and passes the Toxicity Characteristics Leaching Procedure (TCLP) leach test, and can be disposed of in a non-hazardous landfill.

4.0 Summary of Experimental Results

4.1 Sample Characterization

A 5-gallon sample of stormwater was obtained by ENSR from the AK-WA site. This sample was analyzed for total copper and zinc concentrations using two different methods. Analytical results varied significantly depending on the analytical technique used. Results were as follows:

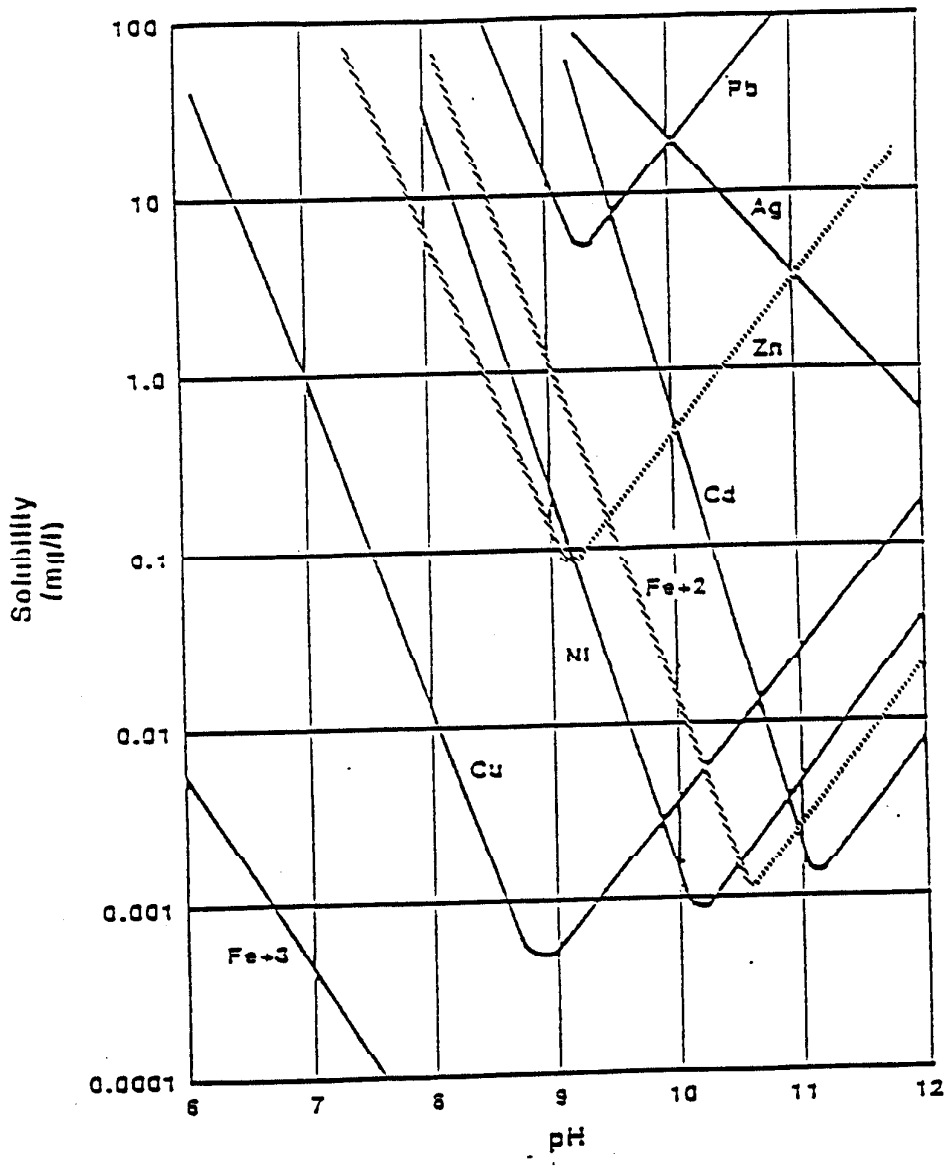


Figure 1. Solubilities of Metal Hydroxides as a Function of pH

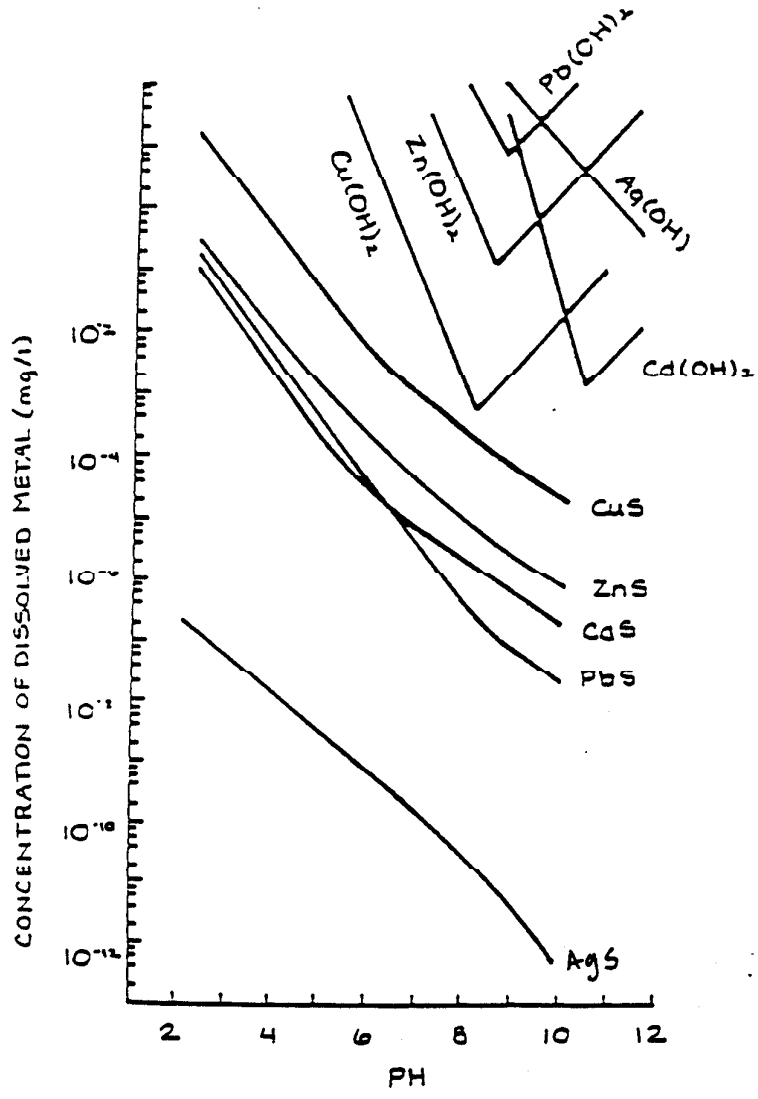


Figure 2. Solubilities of Metal Hydroxides and Sulfides as a Function of pH

Element	Analytical Method	Concentration (mg/l)
Copper	Atomic Absorption	338
Copper	Graphite Furnace	350
Zinc	Atomic Absorption	8,790
Zinc	Graphite Furnace	2,690

This sample was used in the laboratory treatability tests. Results obtained using the atomic absorption techniques were viewed as more accurate since they were repeated a couple of times during the treatability test program.

4.2 Effect of pH on Metals Precipitation

Lime was used in the metals precipitation experiments as the source of hydroxides. The advantage of lime is its low cost. The disadvantage of lime is its low solubility in water. This results in the formation of undesirable sludge in the process. Tests were conducted to determine the effect of pH on zinc and copper removal. The results show that zinc can be removed to less than 20 μg/l with adjustment to pH of 11 and filtering through a 0.5-micron filter paper. Copper was reduced to 73 μg/l in the same test. Atomic absorption was used to analyze metals in the treated water. The detection limit of the analytical method was 20 μg/l for both metals. Another series of experiments was performed to determine the effect of pH adjustment on the presence of sodium sulfide. The results are shown in Figure 3. These tests demonstrated that both copper and zinc can be reduced to less than 20 μg/l after treatment and filtration through a 0.5-micron filter.

4.3 Effect of Sodium Sulfide Concentration on Metals Precipitation

Experiments were conducted to determine the effect of sodium sulfide concentration on copper and zinc removal efficiencies. In these experiments, the pH in the water sample was adjusted to 11 using lime. Sodium sulfide was added to the pH-adjusted sample at varying concentrations. The treated water was then filtered using a 0.5-micron filter before metals analysis. The concentration of zinc in the treated water was below the detection limit of 20 μg/l under all experimental conditions, indicating that sodium sulfide was not needed to meet the effluent zinc limit. This also indicated that zinc can be effectively removed to below detection limit by pH adjustment to 11 and filtration through a 0.5-micron filter.

Results in Figure 4, however, show a clear dependence of copper removal on sodium sulfide concentration. At 0 mg/l sulfide, the copper concentration in the treated water was 73 μg/l. As the concentration of sulfide in the water increased, the concentration of copper in the treated water decreased. Results also indicate that sulfide concentration greater than 50 μg/l had negligible effect on copper removal efficiency.

Figure 3

EFFECT OF PH ON METALS PRECIPITATION

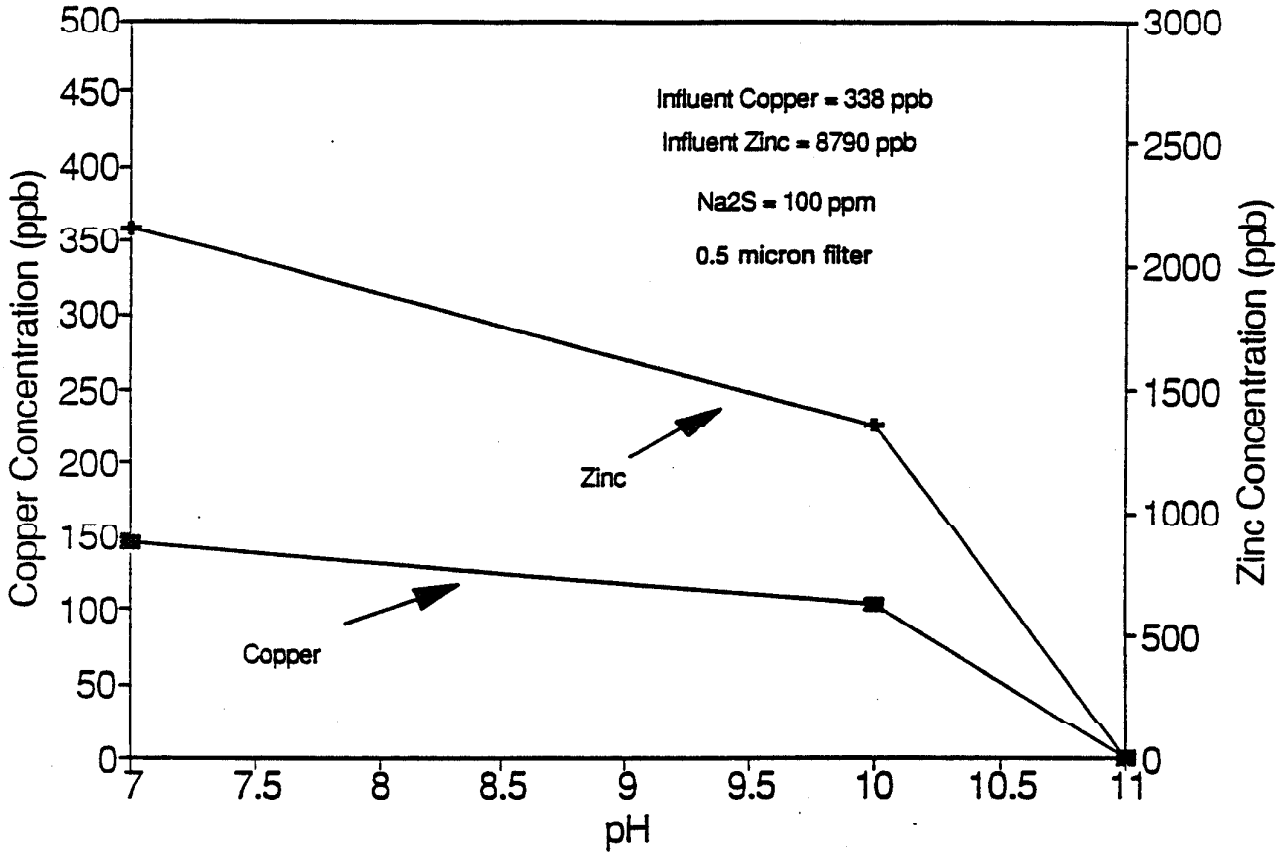
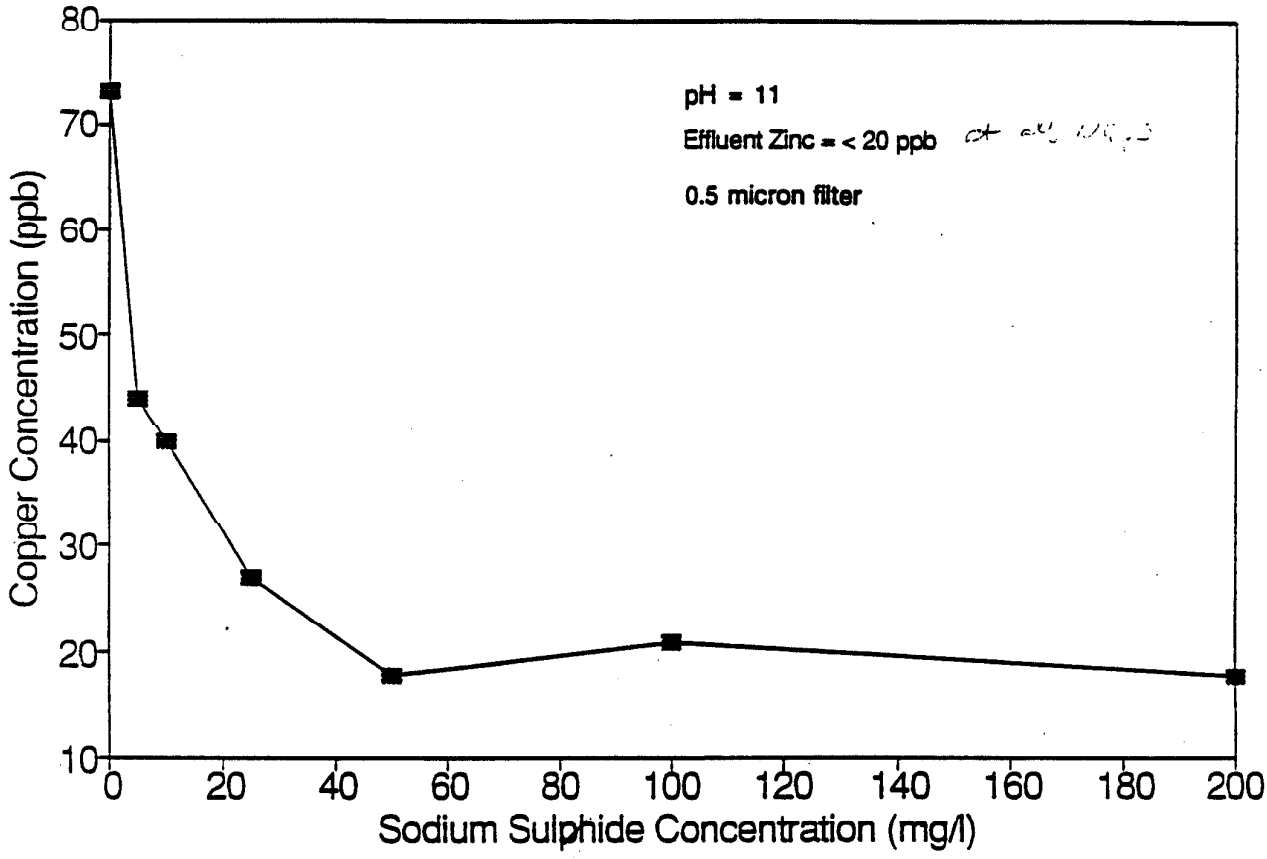


Figure 4

EFFECT OF SULFIDE ON METALS PRECIPITATION



4.4 Effect of Filter Size on Metals Removal Efficiency

Preliminary tests indicated that the filter pore size was an important parameter in metals removal from the hydroxide and sulfide treated water. In addition, results indicated that filter size had a greater effect on zinc removal than copper removal. Tests were conducted where water samples were adjusted to pH 11 with lime, treated with 50 mg/l sodium sulfide, and filtered through filter papers ranging in pore size from 0.5 to 25 microns. Results of these tests are shown in Figure 5. Filter pore size had a greater effect on zinc removal than copper removal. Zinc concentration in the treated water decreased from 5,000 μg/l to below 20 μg/l when the filter pore size was reduced from 25 microns to 0.5 micron. Copper concentration decreased from 200 μg/l to below 20 μg/l when the filter pore size was reduced from 25 microns to 0.5 micron.

4.5 Effect of CETCO Flocculation Agents on Metals Removal

As mentioned earlier, the RM-10 series flocculation agents manufactured by CETCO help break down the oil emulsion and precipitate metals in the form of a non-hazardous sludge. The advantage of using these chemicals is easy flocculation and settling of insoluble metals and oil particles. Three chemicals were obtained from CETCO and tested in the treatability studies. These chemicals were identified as RM-10C, RM-10 NKT, and ACCOFLOC. The first two compounds are designed for metals precipitation. The ACCOFLOC is designed for easy flocculation and settling. These reagents were used in CETCO-recommended dosages in the treatability studies.

Seventeen experiments were conducted to evaluate the effects of pH, sodium sulfide, CETCO reagents, and post-treatment (e.g., filtration vs. gravity settling) on copper and zinc removal. Table 1 shows the experimental results. Experiments 1-6 were conducted at a pH of 9 or 9.2. No sulfide was used in these experiments. Concentrations of RM-10 C, RM-10 NKT, and ACCOFLOC were varied in these experiments. The sludge was gravity settled in all the cases and the treated water was filtered using a 0.5-micron filter. Copper concentrations in the treated samples ranged from 20 to 66 μg/l. Concentrations of zinc in samples from experiments 2-6 were below the detection limit of 20 μg/l. The zinc concentration in the treated sample from experiment 1 was 70 μg/l. Results indicated that ACCOFLOC, an effective flocculating agent had no effect in copper removal beyond the 100 mg/l dosage. RM-10 NKT was slightly more effective in removing copper than RM-10 C (20 and 40 μg/l vs 30-66 μg/l).

In experiments 7-10, sodium sulfide at a concentration of 50 mg/l was used at lime-adjusted pH of 11 as the precipitation agent for copper and zinc. ACCOFLOC at 100 mg/l was added to settle the sludge. The treated water was then filtered using filters ranging in pore size from 0.5 to 25 microns. Results indicated that the concentrations of copper in the treated samples decreased from 208 to 13 μg/l as the filter pore size decreased from 25 microns to 0.5 micron. Filter pore size had a much more dramatic effect on zinc removal. Concentrations of zinc in the treated samples decreased from over 5,000 μg/l to below the detection limit of 20 μg/l.

In experiments 11-13, filtration was replaced with free gravity settling. The concentrations of sulfide during treatment ranged from 50 to 300 mg/l. Samples in these experiments also received 100 mg/l of ACCOFLOC. Results indicate that the concentration of copper in all cases was below the detection limit of 20 μg/l. The concentration of zinc in the treated samples ranged from 294 to 330 μg/l.

Figure 5

EFFECT OF FILTER SIZE ON METALS PRECIPITATION

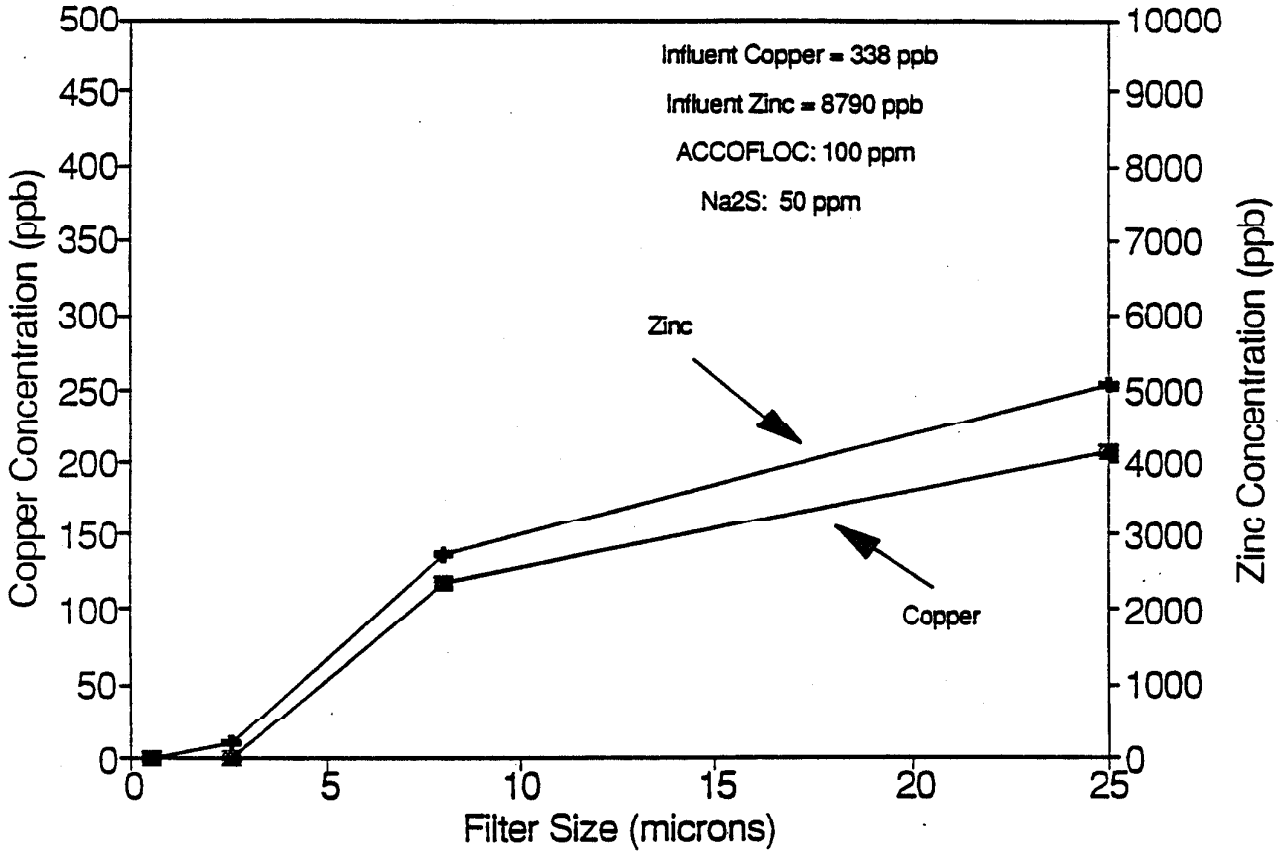


TABLE 1

Effect of CETCO Flocculation Agents on Metals Removal

Experiment #	pH	Na_2S (mg/l)	RM-10C (mg/l)	RM-10 NKT (mg/l)	ACCOFLOC (mg/l)	Post-Treatment[1]	CU (µg/l)	Zn (µg/l)
1	9	0	1,000	0	0	Filter (0.5)	60	70
2	9	0	0	1,000	0	Filter (0.5)	40	<20
3	9	0	1,000	0	100	Filter (0.5)	30	<20
4	9	0	0	1,000	100	Filter (0.5)	20	<20
5	9.2	0	1,000	0	100	Filter (0.5)	64	<20
6	9.2	0	1,000	0	300	Filter (0.5)	66	<20
7	11	50	0	0	100	Filter (0.5)	13 J[2]	<20
8	11	50	0	0	100	Filter (2.5)	16 J	180
9	11	50	0	0	100	Filter (8)	119	2,750
10	11	50	0	0	100	Filter (25)	208	5,070
11	11	50	0	0	100	Settled	19 J	327
12	11	100	0	0	100	Settled	<20	330
14	11	300	0	0	100	Settled	17 J	294
15	11	100	0	0	0	Filter (25)	72	1,540
16	11	200	0	0	0	Filter (25)	57	1,205
17	11	300	0	0	0	Filter (25)	56	1,375

1 - Filter size in microns indicated in parentheses.
2 - J means the compound was identified but was below detection limit.

The conditions in experiments 14-16 were similar to those used in experiments 11-13 except no ACCOFLOC was used in these tests. The treated samples were also filtered using a 25-micron filter paper after free gravity settling. Results indicated that removing ACCOFLOC from the treatment scheme increased copper concentration by approximately three-fold and increased zinc concentration approximately 4- to 5-fold. The advantage of using ACCOFLOC is the elimination of 0.5-micron filtration unit operation. Results of experiments 11-16 also indicated that sodium sulfide beyond a concentration of 50 mg/l had a negligible effect on copper and zinc removal from stormwater.

5.0 Treatment Options

Based on the results of experimental work, three treatment options were identified. These options are briefly discussed here.

5.1 Option 1: Sulfide Precipitation Followed by Filtration

This option consists of sulfide precipitation of copper and zinc at pH 11 followed by filtration of precipitated metals using a 0.5-micron filter. Although lime was used to form the insoluble metals hydroxide, preliminary testing has indicated that sodium hydroxide can be used as the source of alkalinity as well. The advantage of using sodium hydroxide is the elimination of lime sludge. The disadvantage is that sodium hydroxide costs more than lime. Tests indicate the concentration of sodium sulfide required for effective copper and zinc removal is approximately 50 mg/l. To remove the insoluble metal sulfides from the treated water, a 0.5- or 2.5-micron filter may be necessary. At 0.5 micron, the concentration of both metals in the treated water is below the detection limit of 20 μg/l. At 2.5-micron filtration, the concentrations of copper and zinc in the treated water are 16 μg/l. and 180 μg/l. respectively.

The advantage of this option is the low dosage and cost of reagent required to produce water at low concentrations of copper and zinc. The disadvantage is the relatively large quantity of solids that have to be continuously removed from the treated water using a filter unit. In the presence of suspended solids in the influent water, the load on the filtration unit is further increased.

5.2 Option 2: Sulfide Precipitation Followed by Flocculation and Settling/Filtration

In this option, the copper and zinc are initially precipitated by using 50 mg/l of sulfide at a lime-adjusted pH of 11. The precipitation is followed by 100-mg/l ACCOFLOC settling of the insoluble sludge. The supernatant water will contain copper at less than 20 μg/l and zinc at approximately 300 μg/l. This water can be further polished to reduce its zinc to below 20 μg/l using a 0.5- to 1.5-micron filtration step.

The advantage of this option is that ACCOFLOC can be used to settle the majority of the suspended solids, oil, and precipitated metals. A filter can be used to achieve further zinc removal by removing colloidal zinc precipitate from treated water. The load on the filtration unit in this option is significantly reduced compared to Option 1. The disadvantage of this option is a slightly higher dosage of reagent used.

5.3 Option 3: Flocculation Followed by Filtration

This option consists of using flocculating agents such as CETCO RM-10 series products at approximately 1,000-mg/l concentration followed by filtration of the treated water as a polishing step. The advantage of this option is the elimination of sulfide as a reagent and elimination of the potential for overloading the polishing filter. The disadvantage is the high dosage of flocculating agents that has to be used.

6.0 Design Basis

The following design basis was used in the preliminary design calculations for the treatment system:

Copper:	500 µg/l
Zinc:	5,000 µg/l
TSS:	100 mg/l
Annual Flow:	1,670,000 gallons total discharge

Although more stormwater characterization data will be required on the different outfalls, the above values are believed to be representative of the flow and composition of the discharge streams. The treatment capacity of the metals removal process is determined based on the criterion that the unit must treat water accumulated from a worst case, 6-month, 24-hour storm. This storm would produce approximately 55,000 gallons of water. To accommodate this design criterion, an 80,000-gallon holding/equalization tank will be included in the design of the treatment unit. All stormwater runoff will be collected in this tank. The metals removal unit will be started up and operated continuously once the water in the tank reaches approximately the 25 percent level.

The treatment system would be designed for continuous operation at a rate of 15 gpm. The system would be started when the holding tank reaches a level of 25 percent. This would allow a minimum operating time of about 24 hours. During a worst case storm event it would take about 72 hours to treat the accumulated stormwater (55,000 gallons).

7.0 Schematic Diagram of the Treatment Option

A schematic diagram of the proposed system is shown in Figure 3-1 in the Engineering Report. The equipment consists of a stormwater sump and lift station, holding/equalization tank, reactor/flocculating tank, treatment chemical storage and delivery equipment, sludge dewatering press, a treated water filter and backwash clarifier, and a final pH adjustment mixing tank.

Stormwater will be collected in a sump then pumped to the holding/equalization tank. The sump and lift pump(s) should be capable of transferring 300 gpm. The pump(s) will be controlled by the sump level. The holding/equalization tank should be sized based on a cost/benefit analysis of treatment system flow capacity versus tank and treatment system cost. A minimum tank size of 60,000 gallons is required to handle the required volume of stormwater expected. An extra margin of 20,000 gallons is recommended to allow for greater system reliability, and to reduce the required flow rate of the treatment system. The holding/equalization tank will reduce fluctuations in the composition of the stormwater.

The stormwater will be pumped from the holding tank to the treatment system reaction vessel. The stormwater is treated first with sodium hydroxide or lime to adjust the pH to 11, then sodium sulfide or a flocculating chemical to form metal precipitate sludge. The stormwater from the reactor flows to a clarifier where the sludge is removed. The treated water flows to a filter for final removal of suspended solids. Two options are possible for the stormwater filter, disposable cartridge or bag filters, or a permanent backwashable cartridge filter. The permanent backwashable filter was assumed for the treatment system. The backwash from the filter would flow back to the holding tank. The sludge from the clarifier is sent to a filter press which will de-water the sludge to a water content of approximately 30 to 40 percent. The pH of the treated water would be adjusted with sulfuric acid prior to discharge. It is assumed a small tank would be used for mixing the acid and treated water. The treated water would be discharged through a diffuser.

The cost of a skid-mounted unit including, a holding/equalization tank, pumps, a reaction tank, chemical storage tanks and metering pumps, a cartridge filter, a filter press for sludge dewatering, and pH control instrumentation is estimated to be approximately $400,000. The cost of foundation work, electrical hookup and starters, piping, controls, and sampling station are not included in the cost.

8.0 Operational Cost Estimate

Operating costs consist of chemicals, power, labor, maintenance, and sludge disposal. The chemicals that are needed for treating AK-WA water depend on the selected treatment option. The quantity of sludge that is produced also depends on the treatment option selected. A preliminary operational cost estimate was made using laboratory data. Large-scale batch tests were conducted in the laboratory using the three treatment options to develop operational data. The total annual operational cost for the three options was estimated as follows:

Option #1:	$26,000
Option #2:	$33,000
Option #3:	$40,000

The above operational costs do not include the labor cost for operating the plant. A breakdown of the various elements of the operating cost follows.

8.1 Chemicals Cost

The chemicals cost is a strong function of the treatment option used. Chemicals used in Option 1 are: lime or caustic, sodium sulfide, and sulfuric acid. The advantage of using lime is low cost. The disadvantage is a larger quantity of sludge produced.

Option #	Annual Chemical Cost
1	$ 5,000
2	8,000
3	15,000

8.2 Sludge Disposal Cost

The quantity of sludge produced would also vary depending on the treatment option used. Option 1 produces the least amount of sludge and Option 3 the most because of the high concentration of reagent used in the latter. Based on the preliminary information, the following estimates have been made for annual sludge production:

Option #	Annual Wet Sludge Production
1	5 to 10 tons
2	10 to 20 tons
3	20 to 30 tons

The quantity of sludge produced will ultimately depend on the quantity of chemicals used and the concentrations of metals, oil and grease, and total suspended solids (TSS). In arriving at the above estimates, the solid content of the sludge was assumed to be 30 percent. Depending on the regulatory classification of the sludge, its disposal cost can vary from $50 to $200 per ton. A TCLP leach test should be conducted to determine whether the sludge should be classified as hazardous or non-hazardous. CETCO claims that the advantage of using their chemicals is the generation of non-hazardous sludge. At $200/ton, the sludge disposal cost would range from $2,000 to $6,000 per year (the upper range for sludge disposal cost was used in the cost calculation).

8.3 Power Cost

It is estimated that the total power requirement for operating the treatment unit is 120 kWh per day. At approximately eight cents per kWh, this amounts to approximately $4,000 per year in power cost.

8.4 Maintenance Cost

Annual maintenance cost is generally estimated at 5 to 10 percent of the total capital cost. In the proposed treatment unit, since a big fraction of the capital cost is associated with the equalization tank which is a low maintenance unit, a 5 percent value has been used in estimating the maintenance cost. The annual maintenance cost for all the options is estimated to be approximately $20,000 (assuming a capital cost of $400,000; see Section 9.0 below).

8.5 Labor Cost

No labor cost estimate has been made in this program. One part-time operator should be able to easily operate the treatment unit.

9.0 Capital Cost Estimate

A preliminary estimate was made for the capital cost of a skid-mounted unit. This estimate is a preliminary one and has been calculated based on the laboratory data. It should be viewed as a ±30 percent estimate. A more accurate estimate can be made once a treatment option has been selected. A preassembled unit can also be purchased from CETCO. The total capital cost is estimated to range from $250,000 to $400,000. This includes all the unit operations discussed in Section 7.0.

10.0 Recommendations

Although several laboratory treatability tests were conducted during this program, it is recommended that additional tests be conducted to finalize the treatment design, determine the sludge production, and accurately estimate operational costs. These tests would also include more detailed analysis of oil and grease, and TSS in actual storm water from Outfall 003. A sample of the water should be sent to CETCO to conduct a test to determine the exact RM-10 formulation which would help achieve the regulatory requirement on the effluent stream. Finally, a more accurate capital cost estimate should be made.

Summary of Laboratory Results

AK-WA Wastewater Project
JA03056.001

Preliminary Data:

Sample ID	pH	COD(ppm)
Outfall 003	7.1	74
Outfall 004	7.3	84
Tap water	8	--

Outfall 003 Treatment:

Sample Treatment	Sample ID	pH	Lime	NaOH	Na2S (ppm)	RM-10 C (%)	RM-10 NKT (%)	ACCOFLO (ppm)	Post-Treatment	Filter Time (minutes)		Cu (ppb)	Zn (ppb)	Notes/Comments
1	TM7-21-1	7			0	0	0	0	---			350	2690	As Is
2	TM7-21-2	7			0	0	0	0	Centrifuged			290	2780	As Is
3	TM7-21-3	9	•		0	0	0	0	Centrifuged			250	2030	
4	TM7-22-1	10	•		100	0	0	0	Centrifuged			44	2490	Hydrox Precip.
5	TM7-22-2	10	•		100	0	0	0	Filtered (0.5)			19	70	Hydrox Precip.
6	TM7-22-3	7			100	0	0	0	Filtered (0.5)			146	2150	Hydrox Precip.
7	TM7-22-4	10		•	100	0	0	0	Filtered (0.5)			104	1360	Hydrox Precip.
8	TM7-25-1	11	•		100	0	0	0	Filtered (0.5)			<20	<20	Sulfide Precip.
9	TM7-25-2	11	•		200	0	0	0	Filtered (0.5)			<20	<20	Sulfide Precip.
10	TM7-25-3	10	•		200	0	0	0	Filtered (0.5)			80	1300	Sulfide Precip.
11	TM7-23-1	9	•		0	0.1	0	0	Filtered (0.5)	2.75		60	70	CETCO Treatment
12	TM7-23-2	9	•		0	0	0.1	0	Filtered (0.5)	3.67		40	<20	CETCO Treatment
13	TM7-23-3	9	•		0	0.1	0	100	Filtered (0.5)	0.2		30	<20	CETCO Treatment
14	TM7-23-4	9	•		0	0	0.1	100	Filtered (0.5)	>10		20	<20	CETCO Treatment

Outfall 003 Treatment: Sulfide Follow-up

Sample Treatment	Sample ID	pH	Lime	NaOH	Na2S (ppm)	RM-10 C (%)	RM 10 NKT (%)	ACCOFLO (ppm)	Post-Treatment	Filter Time (minutes)		Cu (ppb)	Zn (ppb)	Notes/Comments
1	AKWA-1-D	11			0	0	0	0	Filtered (0.5)	0.03		<20	<20	D.I. Blank
2	AKWA-1-1	11	•		0	0	0	0	Filtered (0.5)	2.2		73	<20	
3	AKWA-1-2	11	•		5	0	0	0	Filtered (0.5)	2.16		44	<20	
4	AKWA-1-3	11	•		10	0	0	0	Filtered (0.5)	2.03		40	<20	
5	AKWA-1-4	11	•		25	0	0	0	Filtered (0.5)	1.72		27	<20	
6	AKWA-1-5	11	•		50	0	0	0	Filtered (0.5)	1.32		18	<20	
7	AKWA-1-6	11	•		100	0	0	0	Filtered (0.5)	0.97		21	<20	
8	AKWA-1-7	11	•		200	0	0	0	Filtered (0.5)	0.63		19	<20	

Outfall 003 Treatment: Sulfide Follow-up 13Oct93 TRM

Sample Treatment	Sample ID	pH	Lime	NaOH	Na2S (ppm)	RM 10 C (%)	RM 10 NKT (%)	ACCOFLO (ppm)	Post-Treatment	Settle/Filter (minutes)		Cu (ppb)	Zn (ppb)	Notes/Comments
1	AKWA-6-1	9.2	•		0	0	0	200	Settled	0.08		266	6230	
2	AKWA-6-2	9.2	•		0	0	0	0	Filtered (25)	Immediate		295	6410	
3	AKWA-6-3	11	•		50	0	0	0	Filtered (25)	1.05		81	1680	
4	AKWA-6-4	11	•		50	0	0	100	Settled	0.75		56	1520	
5	AKWA-6-5	11	•		50	0	0	200	Settled	0.75		188	544	
6	AKWA-6-6	11	•		25	0	0	100	Settled	0.75		108	1150	

Outfall 003 Treatment: Sulfide Follow-up 14Oct93 TRM

Sample Treatment	Sample ID	pH	Lime	NaOH	Na2S (ppm)	RM 10 C (ppm)	RM 10 NKT (ppm)	ACCOFLO (ppm)	Post-Treatment	Settle/Filter (minutes)		Cu (ppb)	Zn (ppb)	Notes/Comments
1	AKWA-7-1	7.2			0	1000	0	100	Settled	0.75		160	4910	
2	AKWA-7-2	11	•		50	0	0	100	Settled	0.75		19J	327	
3	AKWA-7-3	11	•		100	0	0	100	Settled	0.75		<20	330	
4	AKWA-7-4	11	•		200	0	0	100	Settled	0.75		113	2850	
5	AKWA-7-5	11	•		300	0	0	100	Settled	0.75		17J	294	
6	AKWA-7-6	11	•		100	0	0	0	Filtered (25)	0.23		72	1540	
7	AKWA-7-7	11	•		200	0	0	0	Filtered (25)	0.08		57	1205	
8	AKWA-7-8	11	•		300	0	0	0	Filtered (25)	0.13		56	1375	
9	AKWA-7-9	11	•		200	0	0	0	Filtered (0.5)	0.47		<20	<20	

Outfall 003 Treatment: Sulfide Follow-up 15Oct93 TRM

Sample Treatment	Sample ID	pH	Line	NaOH	Na2S (ppm)	RM 10 C (ppm)	RM 10 NKT (ppm)	ACCOFLO (ppm)	Post-Treatment	Settle/Filter (minutes)		Cu (ppb)	Zn (ppb)	Notes/Comments
--	003	7.2			0	0	0	0	--	--		338	8790	As is
1	AKWA-8-1	9.2	"		0	1000	0	100	Filter (0.5)	16.1		217	6600	5 filters reqd
2	AKWA-8-2	12	"		50	0	0	0	Filter (25)	4.77		248	6190	
3	AKWA-8-3	11	"		50	0	0	100	Filter (0.5)	2.92		13J	<20	
4	AKWA-8-4	11	"		50	0	0	100	Filter (2.5)	16.25		16J	180	
5	AKWA-8-5	11	"		50	0	0	100	Filter (8)	7.15		119	2750	
6	AKWA-8-6	11	"		50	0	0	100	Filter (25)	0.08		208	5070	
7	AKWA-8-7	11	"		50	0	0	0	Filter (0.5)	1.15		<20	<20	
8	AKWA-8-8	11	"		50	0	0	0	Filter (2.5)	15.08		16J	203	
9	AKWA-8-9	11	"		50	0	0	0	Filter (8)	2.77		92	2180	
10	AKWA-8-10	11	"		50	0	0	0	Filter (25)	0.08		265	6470	
11	AKWA-9-1	9.2	"		0	1000	0	100	Filter (0.5)	2.25		64	<20	10 ml of 1000
12	AKWA-9-2	9.2	"		0	1000	0	300	Filter (0.5)	4.57		66	<20	3 ml of 10000

S U R O

DEPARTMENT OF ECOLOGY ENVIRONMENTAL REPORT

RECORDER: MIRIAM DUERR WEATHER: TIDE: 311115

DATE: 09/10/94 TIME: 12:04:00 COUNTY: PIERCE WATERWAY: COMMEN - M.LEEDS WAY

REPORTED BY: DOUG NELSON, TRIDENT SEAFOOD | LOC DESC: AK-WA SHIPYARD - TACOMA
BUS NAME: TRIDENT SEAFOOD
ADDRESS: 5303 SHILSHOLE AVE NW |
CITY: SEATTLE STATE: WA |
ZIP: 98107 HOME PHONE: (206)-783-3818 |
BUS PHONE: (206)-997-7103 PAGER | CITY: TACOMA
ANONYMOUS: BEST TIME TO CALL: |

ALLEGED VIOLATOR: AK-WA SHIPYARD
ADDRESS: 401 ALIXANDER AVE BLDG
CITY: TACOMA STATE: WA EXT:
ZIP: 98107 PHONE: (206)-272-0108
CONTACT: DEAN JOHNSON PHONE: (206)-272-0108

MEDIUM: SURFACE WATER MAT TYPE:

MATERIAL: OIL/PETROLEUM SOURCE: VESSEL/SHIP INCIDENT

QUANTITY: 100 GALLONS ACTUAL QUANTITY:

PROGRAM: SPILLS SECTION HD HEINITZ INSPECTOR: M. DUERR

DATE INVEST: 09/10/94 DATE CLOSED: 09/10/94 IMPACT: ENVIRONMENT
NONPOINT: POINT: LUST:
ACTION TAKEN: TELEPHONE CAUSE: ACCIDENT

REFERRAL TO OUTSIDE ENTITY:
ENTITY NAME:_____ CONTACT: _____
DATE REFERRED / / PHONE ( ) -

NARRATIVE: DOUG NELSON, SEAFOOD, CALLED TO REPORT (SMALL) QUANTITY OF OIL SPILLED LAST NIGHT AT AK-WA SHIPYARD. AK-WA SHIPYARD WORKING ON TRIDENT SEAFOOD'S SHIP, INDEPENDENCE, & OUT THRU HULL. OIL & SOME WATER RELEASED ONTO DOCK & INTO HYLEBOS. PUMP TRUCK CALLED OUT LAST NIGHT & ABSORBANTS PLACED ON SPILL. MR. NELSON NOTIFIED NRC & USCG. NOTICED SHEEN ON WATER THIS MORING. I REMINDED
MR. NELSON OF IMMEDIATE NOTIFICATION & TOLD HIM I'D SEND STATE MAP WITH NEW EMERGENCY PHONE NUMBERS. OUTSIDE AGENCY - PORT OF TACOMA - SUZANNE DUDZIK. CC TCP, GREG CLOUD/WQ.

SAMPLES YES OR NO REPORT REQUESTED YES OR NO PICTURES YES OR NO

S W R O

DEPARTMENT OF ECOLOGY ENVIRONMENTAL REPORT

RECORDER: MIRIAM DUERR WEATHER: TIDE: ID#: S11037

DATE: 09/10/94 TIME: 12:30:00 COUNTY: PIERCE WATERWAY: COMMENCEMENT BAY HYLEBOS WW

REPORTED BY: DEAN JOHNSON, AK-WA SHIPYARD
BUS NAME: AK-WA SHIPYARD
ADDRESS: 401 ALEXANDER AVE
CITY: BLDG 9588 - TACOMA STATE: WA
ZIP: 98421 HOME PHONE:
BUS PHONE: (206)-272-0108
ANONYMOUS: BEST TIME TO CALL:

LOC DESC: AK-WA SHIPYARD - 401 ALEXANDER AVE - BLDG 9588 - TACOMA

CITY: TACOMA

ALLEGED VIOLATOR: AK-WA SHIPYARD
ADDRESS: 401 ALEXANDER AVE BLDG 9588
CITY: TACOMA STATE: WA EXT:
ZIP: 98421 PHONE: (206)-272-0108
CONTACT: DEAN JOHNSON PHONE: (206)-272-0108

MEDIUM: SURFACE WATER MAT TYPE:

MATERIAL: OIL/PETROLEUM SOURCE: VESSEL/SHIP INCIDENT

QUANTITY: 100 GALLONS ACTUAL QUANTITY: 100 GALLONS

PROGRAM: SPILLS SECTION HD HEINITZ INSPECTOR: MIRIAM DUERR

DATE INVEST: 09/10/94 DATE CLOSED: 09/10/94 IMPACT: ENVIRONMENT
NONPOINT: POINT: LUST:
ACTION TAKEN: TELEPHONE CAUSE: ACCIDENT

REFERRAL TO OUTSIDE ENTITY:
ENTITY NAME:_____ CONTACT: _____
DATE REFERRED / / PHONE ( ) -

NARRATIVE: DEAN JOHNSON, AK-WA SHIPYARD, CALLED TO REPORT 100 GALLON OIL RELEASE FROM SHIP IN DRYDOCK. THEY WERE REMOVING BOTTOM PAINT, OUT THROUGH HULL, & OIL SPILLED ONTO DECK AREA & WATERWAY. SHEEN ON WATER. SPILL OCCURRED 9/9/94, 2215 HRS. PLACED DRUM UNDER HOLE IN SHIP & ABSORBANT PADS OVER PUDDLES AREAS & IN WATER. ENVIRONMENTAL TRANSPORT CALLED OUT TO CLEAN UP OIL. NOTIFIED NWRO (KEN FUKOTOMI) WHO REFERRED AK-WA TO SWRO. I REMINDED MR. JOHNSON OF IMMEDIATE REPORTING & TOLD HIM I WOULD SEND HIM STATE MAP WITH NEW EMERGENCY PHONE NUMBERS.

SAMPLES YES OR NO REPORT REQUESTED YES OR NO PICTURES YES OR NO